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ABSTRACT

This task analysis guide is intended to help teachers and administrators develop instructional materials and implement competency-based education in the agricultural science and mechanics courses. Section 1 contains a validated task inventory for agricultural science and mechanics I and II. For each task, applicable information pertaining to performance and enabling objectives, criterion-referenced measures, and suggested instructional activities and aids is provided. In this section, tasks are arranged by worker duty area only, and no attempt is made to sequence tasks in instructional order. Section 2 provides descriptions of the agricultural science and mechanics courses. These materials follow: suggested task sequence listings and course outlines for agricultural science and mechanics I and II. The instructional topics within the course outlines have been cross-referenced with corresponding task/competency codes from the task inventory in Section 1. Appendixes include lists of references, audiovisual suppliers, and tools and equipment. (YLB)

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AGRICULTURAL SCIENCE AND MECHANICS I & II

TASK ANALYSES

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Richmond, Virginia 23216

1987

COMPETENCY-BASED
CBE
EDUCATION

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GUIDE APPLICATION

This task analyses is based on the following Dictionary of Occupational Titles (DOT) job titles contained in the occupational domain of Agricultural Production.

All-Round Logger	454.684-018
Cash Grain Farmer	401.161-010
Christmas Tree Farm Manager	180.117-010
Diversified Crops Farmer	407.161-010
Diversified Crops Farmworker I	407.663-010
Farm and Garden Supplies Sales Representative	272.357-014
Farm Equipment Mechanic I	624.281-010
Farm Equipment Mechanic II	624.381-014
Farm General Manager	180.167-018
Farm Machine Operator	409.683-010
Feed Mixer	520.685-098
Fertilizer Mixer	550.665-018
Field Crop Farmer	404.161-010
Field Crop Farm Worker I	404.663-010
Field Crop Harvest Worker	404.687-014
Fish Hatchery Worker	446.684-010
Floral Designer	142.081-010
Flowers Salesperson	260.357-026
Forest Worker	452.687-010
Forester Aide	452.364-010
Fruit Farmworker I	403.683-010
General Farmer	421.161-010
General Farmworker II	421.687-010
Grain Farmworker I	401.683-010
Greenskeeper II	406.683-010
Horticultural and Nursery Products Salesperson	272.357-022
Horticultural-Speciality Farming Supervisor	405.131-010
Horticultural Worker I	405.684-014
Horticultural Worker II	405.687-014
Industrial-Commercial Groundskeeper	406.684-014
Inside Horticultural-Specialty Grower	405.161-018
Landscape Gardener	408.161-010
Landscape Laborer	408.687-014
Lawn-Service Worker	408.684-010
Machine Farmworker	409.686-010
Nursery Manager	180.167-042
Parks and Groundskeeper	406.687-010
Parts Salesperson	279.357-062
Plant Propagator	405.361-010
Small Engine Mechanic	625.281-034
Soil Conservationist	040.061-054
Surveyor Helper	869.567-010
Tractor Mechanic	620.281-058
Tree-Fruit-and-Nut Crops Farmer	403.161-010
Tree Planter	452.687-018
Vegetable Farmer	402.161-010
Vegetable Farmworker I	402.663-010
Vegetable Harvest Worker	402.687-014
Vine-Fruit Crops Farmer	403.161-014

Therefore, this task analyses is useful in developing and selecting instructional materials and in implementing competency-based education for the following courses:

COURSES

Agricultural Science and Mechanics I
(Va. Code: 8006)

Agricultural Science and Mechanics II
(Va. Code: 8008)

Additional information concerning the application and use of this publication may be obtained from the following office:

Agricultural Education Service
Divisions of Vocational and Adult Education
Department of Education
P.O. Box 6Q
Richmond, Virginia 23216

TASK ANALYSES

FOR

AGRICULTURAL SCIENCE AND MECHANICS I AND II

DEVELOPED BY

VIRGINIA VOCATIONAL CURRICULUM AND RESOURCE CENTER

IN COOPERATION WITH

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF EDUCATION
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RICHMOND, VIRGINIA 23216

1987

FOREWORD

In the next decade, businesses and industries in Virginia will require large numbers of skilled workers. Therefore, vocational education at the secondary and postsecondary levels will have the responsibility of preparing individuals for a variety of occupations.

Competency-based education (CBE) provides the preparation students need for entry into the Virginia work force. The CBE practice of recording competencies developed by students helps them to make a smooth transition between secondary and postsecondary programs when both levels of education are required for career training. In addition, CBE is effective in retraining workers who have been displaced because of changing technology.

This guide will assist teachers and administrators in developing instructional materials that meet the needs of students and industry and comply with the Virginia CBE standards for vocational and adult education.

S. John Davis
Superintendent of Public Instruction

Dewey T. Oakley, Jr.
Administrative Director
Vocational and Adult Education

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INTRODUCTION

This task analyses guide is designed to be used in combination with the Agricultural Education Service Area Resource in order to implement competency-based education in the Agricultural Science and Mechanics courses. The service area resource contains information that pertains to all programs within the Agricultural Education area; the sections of that publication are entitled Occupational Information, Student Organization (Future Farmers of America), Classroom Management Systems, and Recording Systems. This task analyses guide contains the task inventory, suggested task sequence lists, and content outlines for the specific courses in Agricultural Science and Mechanics I and II. Detailed instructions for combined use of these two publications are contained within the service area resource.

Using the Task Analyses

Section 1 contains a validated task inventory for Agricultural Science and Mechanics I and II. For each task, applicable information pertaining to performance and enabling objectives, criterion-referenced measures, and suggested instructional activities and aids is provided. Tasks are arranged by worker duty area only, and the suggested task sequence lists from Section 2 (as adapted by the local system) should be used to establish teaching order of the tasks.

Section 2 of the task analyses guide provides descriptions of the Agricultural Science and Mechanics courses, followed by suggested task sequence listings and course outlines for Agricultural Science and Mechanics I and II. The instructional topics within the course outlines have been cross-referenced with corresponding task/competency codes from the task inventory in Section 1.

It is suggested that the Section 2 task sequence lists and course content outlines be reviewed initially in order that any desired changes in sequencing of instruction be made. Once the sequencing is confirmed, instructional planning and implementation may proceed through referral to the Section 1 task/competency sheet noted beside each instructional topic within the outline.

SECTION 1

TASK INVENTORY

One of the major characteristics of competency-based education (CBE) is that the course content is based upon actual jobs or tasks performed by the worker. In Virginia, the Department of Education has established standards for competency-based education. According to these standards, competencies must be role-relevant and based upon appropriate research. This standard states:

> Role-relevant competencies are identified and stated.
>
> The competencies, with standards, will be identified through V-TECS, IDECC, and other appropriate research. Advisory committees should be used to review competencies and standards. Competencies in the affective domain will be included. Role-relevant competencies for occupational preparation programs are those that specifically relate to the occupation for which the student is being prepared, as well as to the personal needs of the student. Role-relevant competencies are related also to orientation, exploration, and/or industrial arts experiences which have been identified for students.

Therefore, role-relevant jobs or tasks, called competencies in CBE, must be identified and validated before instructional materials are developed and subsequent instruction takes place. The task list in this task analyses guide is based on the following:

1. Job titles and descriptions found in the Occupational Outlook Handbook and the Dictionary of Occupational Titles
2. Input from agricultural education supervisors and experienced Agricultural Science and Mechanics teachers.

Information collected and reviewed from these sources was used to develop an initial task list. The next step involved in preparing the final task inventory was validation of the task list. Validation is essential if the information collected is to be useful in operating CBE courses and programs. The validation process included interviews with various professionals involved in both agricultural science and mechanics occupations and teachers of agricultural science and mechanics on the secondary level.

The task analyses sheets are arranged by duty areas for the specific domain covered by the guide. Information contained on each sheet is as follows:

1. The task/competency for a given duty area which is performed by incumbent workers
2. Course application information
3. Performance and enabling objectives for instructional planning
4. Criterion-referenced measures for instructional planning
5. Instructional activities and steps required for teaching the task/competency
6. Tools, equipment, and materials/supplies required to provide necessary instruction
7. References and audiovisual materials helpful in teaching the task/competency.

Some criterion-referenced measures involve the use of a checklist to evaluate student performance. In some cases, a checklist is provided and is included with the specific task.

In many instances, learning activities leading to mastery of task/competencies outlined in this section may take place in a cooperative work setting or in actual school-or community-related opportunities for agricultural science and mechanics . However, all performance objectives are presented for classroom or laboratory instruction so they may be used in localities where these opportunities do not exist; they may be easily adapted to actual work situations.

TASK INVENTORY
FOR

AGRICULTURAL SCIENCE AND MECHANICS I AND II

DUTY AREAS

1. Orienting the Student to Agricultural Science and Mechanics
2. Identifying Career Opportunities in Agriculture
3. Participating in a Supervised Occupational Experience Program
4. Using the Agricultural Mechanics Lab
5. Drawing and Sketching Plans for Agricultural Mechanics
6. Identifying Metals
7. Performing Hot Metalworking Operations
8. Reconditioning Agricultural Tools
9. Performing Cold Metalworking Operations
10. Performing Arc Welding Operations
11. Performing Soldering Operations
12. Performing Agricultural Woodworking Operations
13. Performing Agricultural Masonry and Concrete Work
14. Operating Hazardous Farm Equipment
15. Analyzing Soil Factors
16. Growing and Reproducing Agricultural Crops
17 Living in Rural and Urban Areas
18. Training for Leadership
19. Conserving Natural Resources
20. Identifying Breeds of Livestock
21. Selecting Animals
22. Feeding Animals
23. Using Electricity
24. Performing Gas Welding and Cutting Operations
25. Maintaining Small Gasoline Engines
26. Preserving Wood and Metal
27. Performing Rope Work
28. Performing Plumbing Operations

DUTY AREA

1. ORIENTING THE STUDENT TO AGRICULTURAL SCIENCE AND MECHANICS

TASKS/COMPETENCIES

1.1 Identify the scope of agriculture

1.2 Identify the three main components of an agricultural education program

1.3 Identify departmental policies and procedures

1.4 Demonstrate safe and proper use of departmental tools and equipment

1.5 Select and use fire extinguishers

1.6 Secure first aid assistance in case of an accident or emergency

----------------Application--------------

DUTY AREA

1. ORIENTING THE STUDENT TO AGRICULTURAL SCIENCE AND MECHANICS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

1.1 Identify the scope of agriculture

COURSE

Agricultural Science and Mechanics I (8006)

1.1

PERFORMANCE OBJECTIVE

P1.1 Given instructor's guidelines, identify the scope of agriculture on a written or oral quiz. The identification must include the two items (plants and animals) needed to produce food and fiber and the five main areas of agriculture.

SELECTED ENABLING OBJECTIVES

E1.1.1 Name the two main items to produce food and fiber.

E1.1.2 Trace an agricultural product from origin to consumption.

E1.1.3 List the five main areas of agriculture.

CRITERION-REFERENCED MEASURE

C1.1 Scope of agriculture identified on a written or oral quiz including the two main items to produce food and fiber and the five main areas of agriculture.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students name several types of plants used for food and fiber (E1.1.1).
2. Have students name several animals used for food (E1.1.1).
3. Have students trace the steps, stages, and/or processes of an agricultural product from origin to consumption (E1.1.2).
4. Using the above step, have students name the main areas of agriculture and list names of agricultural companies that are involved in each area (E1.1.3).

SELECTED TOOLS AND MATERIALS

Magazines and pictures depicting food and fiber and the main areas of agriculture

SELECTED AUDIOVISUAL MATERIALS

Transparency: Instructor-made to show five areas of agriculture and definitions of agriculture

Sound Filmstrip: Agriculture and Society (A five-part series of filmstrips on agriculture). Vocational Education Productions.

SELECTED REFERENCES

Exploratory Agriculture, Curriculum Guide. Virginia Department of Education.
Terminology in Agricultural Education, p. 6. AAVIM.
Understanding the Agribusiness Concept. Virginia Department of Education.

----------------Application--------------

DUTY AREA

1. ORIENTING THE STUDENT TO AGRICULTURAL SCIENCE AND MECHANICS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

1.2 Identify the three main components of an agricultural education program

COURSE

Agricultural Science and Mechanics I (8006)

1.2

PERFORMANCE OBJECTIVE

P1.2 Given orientation to and information about the agricultural education program, identify the three main components of the program--supervised occupational experience, classroom activities, and FFA--in an oral or written report.

SELECTED ENABLING OBJECTIVES

E1.2.1 Explain the supervised occupational experience aspect of the program.

E1.2.2 Explain the classroom activities part of the program.

E1.2.3 Explain the FFA aspect of the program.

E1.2.4 Explain the interrelationships among the three components of the program.

CRITERION-REFERENCED MEASURE

C1.2 The three components of an agricultural education program--supervised occupational experience, classroom activities, and FFA--identified in an oral or written report.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Use Lesson Plan A, "Recognizing SOE as a Part of Vocational Agriculture," SOE Handbook, pp. 26-29, to explain SOE component (E1.2.1).
2. Use agricultural education curriculum materials and Orientation Notebook and Slides to explain the classroom and FFA components and to show interrelationships (E1.2.1-E1.2.4).
3. Have outstanding students assist by explaining their programs (E1.2.1-E1.2.4).

SELECTED TOOLS AND MATERIALS

Orientation Notebook. FFA.
Student records of former students

SELECTED AUDIOVISUAL MATERIALS

Slides: Orientation Slides. FFA.

Transparencies: Use transparencies in Handbook and Orientation Notebook.

SELECTED REFERENCES

Handbook, Supervised Occupational Experience. FFA.
Student Handbook, Chapter 2. FFA.

----------------Application--------------

DUTY AREA

1. ORIENTING THE STUDENT TO AGRICULTURAL SCIENCE AND MECHANICS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

1.3 Identify departmental policies and procedures

COURSE

Agricultural Science and Mechanics I (8006)

1.3

PERFORMANCE OBJECTIVE

P1.3 Given a copy of departmental policies and procedures for daily operation, safety rules, course objectives, and evaluation procedures, identify the policies and procedures by demonstrating acceptable behavior daily. Compliance will be evaluated periodically using an instructor-prepared checklist.

SELECTED ENABLING OBJECTIVES

E1.3.1 Identify student responsibilities in the classroom, laboratory, and on field trips.

E1.3.2 Identify procedures for the daily operation of the department.

E1.3.3 Identify safe equipment operating procedures.

E1.3.4 Demonstrate safe operation of equipment.

E1.3.5 Identify instructional objectives and evaluation procedures.

CRITERION-REFERENCED MEASURE

C1.3 Departmental policies identified and followed according to periodically administered instructor-prepared checklist, all items rated acceptable.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Assist the students in planning their responsibilities in the classroom, laboratory, and on field trips (E1.3.1).
2. Discuss and provide a copy of departmental policies and procedures for each student (E1.3.2).
3. Discuss how students will be required to pass a safety test on equipment prior to operation, using one tool or item of equipment to demonstrate (E1.2.3, E1.2.4).
4. Explain the operation of the competency-based program (E1.2.5).

SELECTED TOOLS AND MATERIALS

Instructor-prepared policies and procedures
Competency-based education program outline
Examples of safety practices to follow

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Agricultural Education, Service Area Resource. Virginia Department of Education.
Developing Shop Safety Skills. AAVIM.
Practices for Conducting an Effective Agricultural Laboratory Program. Crunkilton.

----------------Application--------------

DUTY AREA

1. ORIENTING THE STUDENT TO AGRICULTURAL SCIENCE AND MECHANICS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

1.4 Demonstrate safe and proper use of departmental tools and equipment

COURSE

Agricultural Science and Mechanics I (8006)

1.4

PERFORMANCE OBJECTIVE

P1.4 Given a department with properly maintained tools and equipment, demonstrate the safe and proper use of tools and equipment. Safe and proper use will be evaluated continuously and must be rated acceptable according to an instructor-prepared checklist.

SELECTED ENABLING OBJECTIVES

E1.4.1 Identify specific safety rules as they apply to the use of tools and equipment.

E1.4.2 Observe safety rules when using tools and equipment.

E1.4.3 Recognize unsafe and hazardous situations that may occur.

E1.4.4 List procedures for reporting safety violations.

E1.4.5 Pass a safety test on the use of each tool and each piece of equipment before use.

CRITERION-REFERENCED MEASURE

C1.4 Safe and proper use of departmental tools and equipment, demonstrated continuously and rated acceptable on an instructor-prepared checklist.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Be sure students have discussed and passed a safety test on tools and equipment prior to use (E1.4.1, E1.4.5).
2. Have students review safety rules immediately before using tools and equipment (E1.4.2).
3. Describe the sound of a machine that is being used unsafely (E1.4.3, E1.4.4).
4. Have students identify characteristics of a machine in unsafe condition immediately after use (E1.4.3, E1.4.4).

SELECTED TOOLS AND MATERIALS

Equipment operator's manuals
Handout: Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

AV Packet: Power Tool Safety. Hobar.
Slides: Developing Shop Safety Skills. AAVIM.

SELECTED REFERENCES

Developing Shop Safety Skills. AAVIM.
Mechanics in Agriculture, 2nd ed. Phipps.
Planning, Organizing and Teaching Agricultural Mechanics. Bear and Hoerner

----------------Application--------------

DUTY AREA

1. ORIENTING THE STUDENT TO AGRICULTURAL SCIENCE AND MECHANICS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

1.5 Select and use fire extinguishers

COURSE

Agricultural Science and Mechanics I (8006)

1.5

PERFORMANCE OBJECTIVE

P.15 Given instructor's demonstration on proper use of fire extinguishers, a variety of fire extinguishers, and a simulation involving classes of fires and types of extinguishers, select and use the correct extinguisher to extinguish the fire. The correct type must be selected and used according to instructor's demonstration, with all items on instructor-prepared checklist rated acceptable.

SELECTED ENABLING OBJECTIVES

E1.5.1 Name the components necessary for a fire.

E1.5.2 Locate fire extinguisher in the laboratory.

E1.5.3 List and describe the different classes of fires.

E1.5.4 Name the types of material used in extinguishers to extinguish each class of fire.

E1.5.5 Demonstrate how to extinguish a fire.

CRITERION-REFERENCED MEASURE

C1.5 Correct extinguisher selected and used to extinguish the fire according to instructor's demonstration, all items on an instructor-prepared checklist rated acceptable.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Discuss the components of the fire triangle (E1.5.1).
2. Have students locate extinguishers, determine the types, and describe the color coding of the area (E1.5.2).
3. Discuss the types of fires and materials used to extinguish fires (E1.5.3, E1.5.4).
4. Invite someone from the fire department to demonstrate the use of fire extinguishers (E1.5.5).

SELECTED TOOLS AND MATERIALS

Fire extinguishers
Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

Transparencies: The Fire Triangle, p. 13F, Vocational Agriculture I. Oklahoma State Board of Vocational and Technical Education.

Types of Fire Extinguishers, p. 14F, Vocational Agriculture I. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Developing Shop Safety Skills. AAVIM

----------------Application--------------

DUTY AREA

1. ORIENTING THE STUDENT TO AGRICULTURAL SCIENCE AND MECHANICS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

1.6 Secure first aid assistance in case of an accident or emergency

COURSE

Agricultural Science and Mechanics I (8006)

1.6

PERFORMANCE OBJECTIVE

P1.6 Given a simulated emergency, secure first aid assistance. Assistance must be obtained according to the procedures given on an instructor-prepared checklist.

SELECTED ENABLING OBJECTIVES

E1.6.1 Locate first aid kit.

E1.6.2 Locate school nurse station and/or provisions for first aid.

E1.6.3 Identify supplies in the first-aid kit.

CRITERION-REFERENCED MEASURE

C1.6 First aid assistance secured according to procedures given on instructor-prepared checklist.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Discuss the use of the items included in the first aid kit (E1.6.1, E1.6.3).
2. Discuss school policy to follow during an emergency (E1.6.2).
3. Invite someone from the rescue squad to demonstrate first aid to the class (E1.6.1, E1.6.2).

SELECTED TOOLS AND MATERIALS

First aid kit
Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

None identified

DUTY AREA

2. IDENTIFYING CAREER OPPORTUNITIES IN AGRICULTURE

TASKS/COMPETENCIES

2.1 Identify possible careers in agriculture

2.2 Select and evaluate local agricultural employment opportunities

2.3 Identify possible careers in off-farm agricultural occupations

2.4 Outline a tentative course of study in advanced agricultural education

DUTY AREA

2. IDENTIFYING CAREER OPPORTUNITIES IN AGRICULTURE

TASK/COMPETENCY

2.1 Identify possible careers in agriculture

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS I

COURSE

Agricultural Science and Mechanics I (8006)

2.1

PERFORMANCE OBJECTIVE

P2.1 Given a list of job titles, identify possible careers in agriculture with 90% accuracy on a written test.

SELECTED ENABLING OBJECTIVES

E2.1.1 Define job title or occupational title.

E2.1.2 Describe the meaning of agriculture.

E2.1.3 Locate sources of information on agricultural careers.

E2.1.4 Distinguish between agricultural careers and industrial careers.

E2.1.5 Separate agricultural careers with the appropriate agricultural occupational areas.

E2.1.6 List agricultural careers in the community.

E2.1.7 Classify job titles for agricultural careers by professional, managerial, technical, skilled, semi-skilled, or unskilled.

CRITERION-REFERENCED MEASURE

C2.1 Possible careers in agriculture identified with 90% accuracy on a written test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students use the Dictionary of Occupational Titles to define job title or occupational title and locate information on agricultural careers (E2.1.1, E2.1.3).
2. Lead students in forming a correct definition of agriculture (E2.1.2).
3. Guide students in the use of Handbook of Agricultural Occupations, Dictionary of Occupational Titles, Agricultural Education Service Area Resource, and Occupational Outlook Handbook (E2.1.3, E2.1.4).
4. Have students separate the job titles given in the Agricultural Education Service Area Resource with the appropriate occupational area: production, agricultural business, etc. (E2.1.5).
5. Have students use the telephone book to identify agricultural careers in the community (E2.1.6).
6. Have students use newspapers to classify job titles for a bulletin board display (E2.1.7).
7. Show films that depict agricultural career opportunities (E2.1.1-E2.1.7).

SELECTED TOOLS AND MATERIALS

Newspaper
Telephone Books

SELECTED AUDIOVISUAL MATERIALS

Transparency:	Occupational Areas in Agriculture, T-21, Handbook, Supervised Occupational Experience. FFA.
Filmstrips:	7 film strips covering the areas in agriculture. Vocational Education Productions.
	Agricultural Career Opportunities. Virginia Department of Agricultural and Consumer Services.

SELECTED REFERENCES

Agricultural Education Service Area Resource. Virginia Department of Education.
Dictionary of Occupational Titles. U.S. Department of Labor, Employment and Training Administration.
Handbook of Agricultural Occupations. Hoover.
Occupational Outlook Handbook. U.S. Department of Labor, Bureau of Labor Statistics.

----------------Application--------------

DUTY AREA

2. IDENTIFYING CAREER OPPORTUNITIES IN AGRICULTURE

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

2.2 Select and evaluate local agricultural employment opportunities

COURSE

Agricultural Science and Mechanics I (8006)

2.2

PERFORMANCE OBJECTIVE

P2.2 Given a list of local agricultural employment opportunities, select and evaluate the characteristics of jobs according to the worksheet provided.

SELECTED ENABLING OBJECTIVES

E2.2.1 Define terms associated with employment.

E2.2.2 Select jobs to investigate.

E2.2.3 Obtain information about a job.

E2.2.4 Interview an employer.

E2.2.5 Compare the characteristics of selected jobs.

CRITERION-REFERENCED MEASURE

C2.2 Local agricultural employment opportunities selected and evaluated by completing the provided worksheet.

WORKSHEET 2.2

DUTY: Identifying Career Opportunities in Agriculture

TASK: Select and evaluate local agricultural employment opportunities

Obtain the following information from a prospective employer, a person working in the same career, or from references.

1. Job selected--

2. Job title--

3. What does the worker do?

4. What tools or equipment are used?

5. Does job require high school education? Technical education?

6. What qualifications, other than education, are necessary?

   Physical

   Mental

   Aptitude or personality

7. What are the working conditions and hours?

8. In what kind of business is this job found?

9. What are the opportunities for advancement?

WORKSHEET 2.2 (continued)

10. What are several related jobs?

11. What interests would this job satisfy?

12. To what abilities is this job related?

13. Will this job require more or fewer employees in the future?

14. What equipment must be purchased?

15. Upon what bases are employees evaluated for promotion?

16. What are the most common mistakes made by employees in performing this job?

17. What are the expected earnings and benefits from this job?

SELECTED INSTRUCTIONAL ACTIVITIES

1. Explain and illustrate terms new to students as they are identified (E2.2.1).
2. Have students use copies of the occupational information presented in the Agricultural Education Service Area Resource to select jobs to investigate (E2.2.2).
3. Use the worksheet provided to record information about a job (E2.2.3).
4. Have students interview someone employed in a job of interest. Have students use the worksheet provided to structure the interview (E2.2.4).
5. Have students discuss the characteristics of jobs that interest them (E2.2.5).

SELECTED TOOLS AND MATERIALS

Worksheet on characteristics of a job
Newspaper
Telephone book
Worksheet 2.2

SELECTED AUDIOVISUAL MATERIALS

Microfiche: Virginia View. Virginia Polytechnic Institute and State University. (may be available in local library).

Transparency: Comparing Two Jobs, T-22, Handbook, Supervised Occupational Experience. FFA.

SELECTED REFERENCES

Agricultural Education Service Area Resource, Section I. Virginia Department of Education.
Agricultural pamphlets listed in Exploratory Agriculture: A Curriculum Guide for Agricultural Education.

----------------Application--------------

DUTY AREA

2. IDENTIFYING CAREER OPPORTUNITIES IN AGRICULTURE

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

2.3 Identify possible careers in off-farm agricultural occupations

COURSE

Agricultural Science and Mechanics II (8008)

2.3

PERFORMANCE OBJECTIVE

P2.3 Given a list of job titles, identify possible careers in off-farm agricultural occupations with 90% accuracy on a written test.

SELECTED ENABLING OBJECTIVES

E2.3.1 Define terms associated with off-farm agricultural occupations.

E2.3.2 Locate information on off-farm agricultural occupations.

E2.3.3 List off-farm careers in the community.

CRITERION-REFERENCED MEASURE

C2.3 Possible careers in off-farm agricultural occupations identified with 90% accuracy on a written test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students define "off-farm" and use the jobs listed in the Agricultural Education Service Area Resource Guide to determine which can be classified as off-farm (E2.3.1, E2.3.2).

2. Have students use newspapers and telephone directory to determine which careers in the community can be classified as off-farm (E2.3.3).

SELECTED TOOLS AND MATERIALS

Newspaper
Telephone book

SELECTED AUDIOVISUAL MATERIALS

Filmstrips:
Agricultural Production. Vocational Education Productions.
Agricultural Products. Vocational Education Productions.
Agricultural Resources. Vocational Education Productions.
Environmental Protection. Vocational Education Productions
Forestry. Vocational Education Productions.
Ornamental Horticulture. Vocational Education Productions.
Supplies and Services. Vocational Education Productions.

SELECTED REFERENCES

Agricultural Education Service Area Resource. Virginia Department of Education.

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DUTY AREA

2. IDENTIFYING CAREER OPPORTUNITIES IN AGRICULTURE

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

2.4 Outline a tentative course of study in advanced agricultural education

COURSE

Agricultural Science and Mechanics II (8008)

2.4

PERFORMANCE OBJECTIVE

P2.4 Given access to information about advanced courses of study in agricultural education, outline a tentative advanced course of study. Outline must include programs, required courses, required time for completion, required skills, and career options.

SELECTED ENABLING OBJECTIVES

E2.4.1 Identify the options available in agricultural education.

E2.4.2 Describe the features of each option.

E2.4.3 Evaluate personal characteristics, career goals, interests, abilities, and motivation.

E2.4.4 Select a tentative option.

E2.4.5 Interview someone in a career associated with the selected option.

E2.4.6 Match personal characteristics to appropriate option.

CRITERION-REFERENCED MEASURE

C2.4 Tentative advanced course of study in agricultural education outlined, including programs, required courses, required time for completion, required skills, and career options.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Use agricultural education planning guide and the SOE record book to identify the option areas and discuss the features of each option (E2.4.1, E2.4.2)
2. Seek the assistance of the guidance counselor in evaluating the interests of the students (E2.4.3).
3. Have students select a tentative option, conduct a personal interview, and determine if their interests match those of the selected option. Repeat the procedure if incorrect option is selected (E2.4.4-E2.4.6).

SELECTED TOOLS AND MATERIALS

None identified

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

A Planning Guide for Agricultural Education Programs in Virginia's Public Schools. Virginia Department of Education.
SOE Record Book in Vocational Agriculture Teacher, pp. 2-3. FFA.

DUTY AREA

3. PARTICIPATING IN A SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM

TASKS/COMPETENCIES

3.1 Survey local occupational experience opportunities

3.2 Develop an annual plan of occupational experience

3.3 Prepare an occupational experience program agreement

3.4 Identify occupational tasks

3.5 Keep records

3.6 Summarize and analyze records of supervised occupational experience programs

3.7 Select FFA proficiency awards applicable to supervised occupational experiences

3.8 Complete FFA proficiency award application

3.9 Demonstrate ability to secure occupational work experience

----------------Application--------------

DUTY AREA

3. PARTICIPATING IN A SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

3.1 Survey local occupational experience opportunities

COURSE

Agricultural Science and Mechanics I (8006)

3.1

PERFORMANCE OBJECTIVE

P3.1 Given access to a local community and a survey form, survey the occupational experience opportunities and list the number and kind of job opportunities available. The list of job opportunities must be within the scope and nature of those obtained by the instructor.

SELECTED ENABLING OBJECTIVES

E3.1.1 Identify job titles.

E3.1.2 Survey literature to determine the number and kind of job opportunities that are available in industry of agriculture.

E3.1.3 Locate local agricultural businesses.

E3.1.4 Set up appointments with local agricultural businesses.

E3.1.5 Interview local agricultural business managers.

CRITERION-REFERENCED MEASURE

C3.1 Local occupational situations surveyed, local job opportunities listed within the scope and nature of those obtained by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students read job descriptions in the Dictionary of Occupational Titles (E3.1.1).
2. Tour the local office of the Virginia Employment Commission (E3.1.2).
3. Have students visit with local agribusinesses to become acquainted with local opportunities (E3.1.2-E3.1.5).
4. Use a field trip to demonstrate to students how to set up appointments and interview people (E3.1.2-E3.1.5).

SELECTED TOOLS AND MATERIALS

Handout: Agricultural Occupation Survey, p. 90, First-Year Teacher's Manual. Virginia Polytechnic Institute and State University.

SELECTED AUDIOVISUAL MATERIALS

Transparency: Tips on Making a Job Interview, in SDE Handbook. FFA.

SELECTED REFERENCES

Conduct a Community Survey, Module A-2. AAVIM.
Dictionary of Occupational Titles. U. S. Department of Labor.

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DUTY AREA

3. PARTICIPATING IN A SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

3.2 Develop an annual plan of occupational experience

COURSE

Agricultural Science and Mechanics I (8006) and II (8008)

3.2

PERFORMANCE OBJECTIVE

P3.2 Given instructor's guidelines and community employment needs, outline an annual plan of occupational experience for the years enrolled in Agricultural Science and Mechanics. This plan must meet guidelines established by the instructor for each student.

SELECTED ENABLING OBJECTIVES

E3.2.1 Define a supervised occupational experience.

E3.2.2 Describe the types of SOE programs.

E3.2.3 List examples of SOE programs.

E3.2.4 Describe the benefits of SOE programs.

E3.2.5 Survey local occupational experience opportunities (P3.1).

E3.2.6 Select experience programs that will meet individual needs.

CRITERION-REFERENCED MEASURE

C3.2 Annual plan of occupational experiences outlined for the years student is enrolled in Agricultural Science and Mechanics, plan accounting for community employment needs and meeting the guidelines established by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Use Lesson Plan A, "Recognizing SOE as a Part of Vocational Agriculture," SOE Handbook, pp. 26-29 (E3.2.1, E3.2.6).
2. Review annual plans of occupational experience of older students (E3.2.3, E3.2.5).
3. Have students list relevant factors from their home environments that will affect their development of annual plans (E3.2.6).

SELECTED TOOLS AND MATERIALS

Charts (as specified in Lesson Plan A above.)
Instructor-prepared guidelines

SELECTED AUDIOVISUAL MATERIALS

Film: Bridging the Gap. Verrand Films, Ltd.
Transparencies: (As specified in Lesson Plan A, above)

SELECTED REFERENCES

SOE Handbook. FFA.
Supervised Occupational Experience in Agricultural Education. Interstate Printers and Publishers.

----------------Application--------------

DUTY AREA

3. PARTICIPATING IN A SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

3.3 Prepare an occupational experience program agreement

COURSE

Agricultural Science and Mechanics I (8006) and II (8008)

3.3

PERFORMANCE OBJECTIVE

P3.3 Given a Virginia Supervised Occupational Experience Record Book and requirements for completing a training agreement, prepare an occupational experience program agreement that identifies the responsibilities of student, teacher, and employer.

SELECTED ENABLING OBJECTIVES

E3.3.1 Explain the purposes of a training agreement.

E3.3.2 Identify the types of information needed in a training agreement.

E3.3.3 Complete an occupational program agreement form.

CRITERION-REFERENCED MEASURE

C3.3 Occupational experience program agreement prepared, identifying responsibilities of student, teacher, and employer.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display and discuss several types of completed agreements (E3.3.2, E3.3.3).
2. Have students identify the types of information needed in an agreement (E3.3.2, E3.3.3).
3. Have students develop and write agreements for hypothetical situations (E3.3.3).

SELECTED TOOLS AND MATERIALS

Occupational experience program agreements
Virginia's Supervised Occupational Experience Record Book

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Advisor's Guide to the Student Handbook. FFA.
SOE Handbook, Appendix E. FFA.
Supervised Occupational Experience in Agricultural Education. Interstate Printers and Publishers.

DUTY AREA

3. PARTICIPATING IN A SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM

TASK/COMPETENCY

3.4 Identify occupational tasks

Application

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006) and II (8008)

3.4

PERFORMANCE OBJECTIVE

P3.4 Given a properly planned occupational experience program, accurately list the job tasks to be learned. The tasks listed must be those appropriate for the occupational program developed for the student.

SELECTED ENABLING OBJECTIVES

E3.4.1 Analyze a properly planned occupational experience program.

E3.4.2 Identify the job tasks of several occupational experience programs.

CRITERION-REFERENCED MEASURE

C3.4 Occupational tasks of a properly planned occupational experience program accurately listed with attention to appropriateness to the program developed for the individual student.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review the job descriptions for various agricultural occupations outlined in the references cited in the Agricultural Education Service Area Resource (E3.4.1, E3.4.2).
2. Have students interview agribusiness person concerning job tasks of employees (E3.4.2).
3. Have students use the Virginia VIEW Career Information System (E3.4.2).
4. Use Lesson Plan B in SOE Handbook (E3.4.1, E3.4.2).

SELECTED TOOLS AND MATERIALS

Supervised Occupational Experience record books completed by previous students

SELECTED AUDIOVISUAL MATERIALS

Microfiche: Virginia VIEW Career Information System. Virginia Polytechnic Institute and State University. (May be available in local library)

SELECTED REFERENCES

Agricultural Education Service Area Resource. Virginia Department of Education.
SOE Handbook. FFA.
Supervised Occupational Experience in Agricultural Education. Interstate Printers and Publishers.

DUTY AREA

3. PARTICIPATING IN A SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM

TASK/COMPETENCY

3.5 Keep records

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006) and II (8008)

3.5

PERFORMANCE OBJECTIVE

P3.5 Given a record book, instructions for keeping records, and a supervised occupational experience program, keep records. All entries must be on the correct forms, and all records must be kept without error.

SELECTED ENABLING OBJECTIVES

E3.5.1 Explain the importance of record keeping.

E3.5.2 Identify types of records.

E3.5.3 List record keeping procedures.

E3.5.4 Record data.

E3.5.5 Store records for safekeeping.

CRITERION-REFERENCED MEASURE

C3.5 Records kept on correct forms without errors.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students review the records of students who have obtained awards based on their records (E3.5.1, E3.5.2).
2. Have students record hypothetical data (E3.5.3, E3.5.4).
3. Have students complete an example in their SOE record books (E3.5.4).
4. Have students practice keeping records on computers (E3.5.4, E3.5.5).

SELECTED TOOLS AND MATERIALS

Samples of well-kept records
Blank records forms

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

SOE Handbook, Lesson Plan B. FFA.
Supervised Occupational Experience in Agricultural Education. Interstate Printers and Publishers.

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DUTY AREA

3. PARTICIPATING IN A SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

3.6 Summarize and analyze records of supervised occupational experience programs

COURSE

Agricultural Science and Mechanics I (8006) and II (8008)

3.6

PERFORMANCE OBJECTIVE

P3.6 Given access to individual occupational experience records, develop a written summary and analysis of the records. Summaries and analyses must come within the standards set by the instructor.

SELECTED ENABLING OBJECTIVES

E3.6.1 Explain the benefits of summarizing and analyzing records.

E3.6.2 Summarize and analyze enterprise records.

E3.6.3 Summarize and analyze placement program records, if applicable.

E3.6.4 Develop financial statement.

E3.6.5 Interpret and use financial statements.

E3.6.6 Evaluate and replan SOE programs.

CRITERION-REFERENCED MEASURE

C3.6 Written summary and analysis of occupational experience and records prepared according to standards set by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students review and summarize occupational experience record books of previous students (E3.6.1-E3.6.6).

2. Use Lesson Plan D, "Analyzing an SOE Program," pp. 40-48 in SOE Handbook (E3.6.1-E3.6.6).

SELECTED TOOLS AND MATERIALS

Individual SOE record books
Charts: as specified in Lesson Plan D, SOE Handbook.

SELECTED AUDIOVISUAL MATERIALS

Transparencies: as specified in Lesson Plan D, SOE Handbook.

SELECTED REFERENCES

SOE Handbook, Lesson Plan D. FFA.
Supervised Occupational Experience in Agricultural Education. Interstate Printers and Publishers.

----------------Application--------------

DUTY AREA

3. PARTICIPATING IN A SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

3.7 Select FFA proficiency awards applicable to supervised occupational experiences

COURSE

Agricultural Science and Mechanics I (8006) and II (8008)

3.7

PERFORMANCE OBJECTIVE

P3.7 Given an individual occupational experience program and information on FFA proficiency awards, select the FFA proficiency awards applicable to the supervised occupational experience program.

SELECTED ENABLING OBJECTIVES

E3.7.1 Explain the importance of proficiency awards.

E3.7.2 List the FFA proficiency awards.

E3.7.3 Explain how the award applies to individual occupational experiences.

CRITERION-REFERENCED MEASURE

C3.7 FFA proficiency awards, applicable to an individual occupational experience program, accurately selected.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students view FFA audiovisual presentation concerning proficiency awards and explain the importance of awards (E3.7.1, E3.7.2).
2. Have students review proficiency award applications of former students (E3.7.3).
3. Have students observe a presentation on proficiency awards by previous recipients (E3.7.1-E3.7.3).

SELECTED TOOLS AND MATERIALS

Copies of proficiency awards

SELECTED AUDIOVISUAL MATERIALS

Film: Agricultural Proficiency Awards. FFA.

SELECTED REFERENCES

Student Handbook, Chapter 6, FFA.

## DUTY AREA	----------------Application-------------- ## PROGRAM
3. PARTICIPATING IN A SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM	AGRICULTURAL SCIENCE AND AND MECHANICS

TASK/COMPETENCY

3.8 Complete FFA proficiency award application

COURSE

Agricultural Science and Mechanics I (8006) and II (8008)

3.8

PERFORMANCE OBJECTIVE

P3.8 Given a FFA proficiency award application form, complete the form according to the guidelines provided by the instructor. The application must be based on student's supervised occupational experience program, and the completed application must be neat.

SELECTED ENABLING OBJECTIVES

E3.8.1 Select applicable proficiency awards.

E3.8.2 Identify the types of information needed on the proficiency award applications.

E3.8.3 List the benefits of winning proficiency awards.

CRITERION-REFERENCED MEASURE

C3.8 Proficiency award application form correctly and neatly completed according to instructor's guidelines and based on student occupational experience program.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Explain the values of winning a proficiency award in order to motivate students (E3.8.3).
2. Have students review a winning proficiency award application of a previous student (E3.8.1, E3.8.2).
3. Arrange a "show and tell" session where students discuss SOE programs (E3.8.1, E3.8.3).

SELECTED TOOLS AND MATERIALS

FFA proficiency award applications
Previously completed proficiency award applications
Instructor-prepared guidelines for completing forms

SELECTED AUDIOVISUAL MATERIALS

Film: Agricultural Proficiency Awards. FFA.

SELECTED REFERENCES

Agricultural Proficiency Handbook. FFA.
Student Handbook, Chapter 6, FFA.

----------------Application--------------

DUTY AREA

3. PARTICIPATING IN A SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

3.9 Demonstrate ability to secure occupational work experience

COURSE

Agricultural Science and Mechanics I (3006) and II (3008)

3.9

PERFORMANCE OBJECTIVE

P3.9 Given a simulated job opening for work that meets occupational experience program requirements, demonstrate ability to secure occupational work experience by setting up and conducting an employment interview that follows guidelines established by the instructor. All items on an instructor-prepared checklist must be rated acceptable.

SELECTED ENABLING OBJECTIVES

E3.9.1 Locate potential job openings.

E3.9.2 Write a job application letter.

E3.9.3 Prepare an application form.

E3.9.4 Make an interview appointment by telephone.

E3.9.5 Dress appropriately for a job interview.

CRITERION-REFERENCED MEASURE

C3.9 Ability to secure occupational work experience demonstrated by setting up and conducting an employment interview with all items on instructor-prepared checklist rated acceptable.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students review newspaper, magazines, etc., to locate possible work experience employment opportunities (E3.9.1).
2. Have students read sections in cited references on how to secure a job (E3.9.1-E3.9.5).
3. Have students write a job application letter (E3.9.2).
4. Have students prepare a job application form (E3.9.3).
5. Have students role play a telephone conversation asking for a job interview (E3.9.4).
6. Have students role play a job interview (E3.9.5).

SELECTED TOOLS AND MATERIALS

Employment application forms
Sample letters of job application
Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

Films: Get That Job--Line Up Your Interview. Audiovisual Services, Virginia Department of Education.

Interview--Ready or Not. Audiovisual Services, Virginia Department of Education.

Job Interview--I Guess I Got the Job. Audiovisual Services, Virginia Department of Education.

SELECTED REFERENCES

How to Find and Apply for a Job. Keily and Walters.
How to Get a Job. Fregly.

DUTY AREA

4. USING THE AGRICULTURAL MECHANICS LAB

TASKS/COMPETENCIES

4.1 Identify values and purposes of agricultural mechanics education

4.2 Maintain good housekeeping activities

4.3 Follow laboratory organization procedures

4.4 Demonstrate and use sound laboratory safety rules

DUTY AREA

4. USING THE AGRICULTURAL MECHANICS LAB

TASK/COMPETENCY

4.1 Identify values and purposes of agricultural mechanics education

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

4.1

PERFORMANCE OBJECTIVE

P4.1 Given information about agricultural mechanics education, identify with 85% accuracy on an instructor-prepared test the values and purposes of agricultural mechanics education appropriate for a selected enterprise.

SELECTED ENABLING OBJECTIVES

E4.1.1 Define agricultural mechanics education.

E4.1.2 Identify mechanical areas in selected enterprises.

E4.1.3 Identify the mechanical skills needed in a selected enterprise.

E4.1.4 Distinguish between good quality and poor quality workmanship.

E4.1.5 List the values and purposes of being able to perform the competencies needed in a selected enterprise.

CRITERION-REFERENCED MEASURE

C4.1 Values and purposes of agricultural mechanics education for a selected enterprise identified with 85% accuracy on an instructor-prepared test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review the six general areas included in agricultural mechanics (E4.1.1).
2. Describe, illustrate, and present examples of projects applicable to each area of the agricultural mechanics laboratory (E4.1.2).
3. Visit an agricultural situation or business requiring agricultural mechanical skills to
   a) identify areas requiring mechanical skills (E4.1.2);
   b) distinguish between high quality and low quality workmanship (E4.1.4);
   c) judge projects (E4.1.4, E4.1.5).
4. Have students discuss and summarize the values and purposes of being able to perform competencies in agricultural mechanics (E4.1.5).

SELECTED TOOLS AND MATERIALS

Examples of agricultural mechanics projects in several enterprises
Instructor-prepared test

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Handbook on Agricultural Education in Public Schools, pp. 375-379. Phipps.
Mechanics in Agriculture, Chapter 1. Phipps.
Planning, Organizing and Teaching Agricultural Mechanics, Appendix B. Bear and Hoerner.
Terminology in Agricultural Education. Knebel and Richardson.

DUTY AREA

4. USING THE AGRICULTURAL MECHANICS LAB

TASK/COMPETENCY

4.2 Maintain good housekeeping activities

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

4.2

PERFORMANCE OBJECTIVE

P4.2 Given access to an agricultural mechanics laboratory, maintain good housekeeping activities according to an instructor-prepared checklist.

SELECTED ENABLING OBJECTIVES

E4.2.1 Identify advantages of a clean and neat laboratory.

E4.2.2 Identify areas to be cleaned.

E4.2.3 Schedule housekeeping activities to be performed.

E4.2.4 Assign personnel to specific housekeeping activities.

E4.2.5 Identify storage areas and items to be stored.

E4.2.6 Return all items to the proper storage areas when work is completed.

E4.2.7 Clean the area and dispose of all trash or residue.

E4.2.8 Keep all items in assigned areas when not in use.

CRITERION-REFERENCED MEASURE

C4.2 Good housekeeping activities in an agricultural mechanics laboratory maintained according to instructor-prepared checklist.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students discuss and develop procedures for keeping work and storage areas neat and clean (E4.2.1-E4.2.8).
2. Have students practice arranging all items in predetermined places (E4.2.5, E4.2.6, E4.2.8).
3. Have students perform the cleaning or serve as supervisor of housekeeping activities, rotating duties and areas to be cleaned (E4.2.2-E4.2.8).

SELECTED TOOLS AND MATERIALS

Cleaning equipment, as appropriate
Housekeeping schedule
Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

Slides:	Developing Shop Safety Skills. AAVIM.
Videotape:	Developing Shop Safety Skills--The Videotape. McCulley and Triplett.

SELECTED REFERENCES

Developing Shop Safety Skills. AAVIM.
Planning, Organizing and Teaching Agricultural Mechanics, p. 192. Bear and Hoerner.

----------------Application--------------

DUTY AREA

4. USING THE AGRICULTURAL MECHANICS LAB

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

4.3 Follow laboratory organization procedures

COURSE

Agricultural Science and Mechanics I (3006)

4.3

PERFORMANCE OBJECTIVE

P4.3 Given access to an agricultural mechanics laboratory and procedures for organization, follow laboratory organization procedures indicated on the instructor's checklist. All items on the checklist must be rated satisfactory.

SELECTED ENABLING OBJECTIVES

E4.3.1 Match color coding on tools with the proper storage areas.

E4.3.2 Perform the duties of laboratory superintendent/foreman.

E4.3.3 Use established procedures to obtain tools and supplies.

E4.3.4 Follow established procedures in keeping areas organized.

E4.3.5 Turn off equipment when work is completed.

E4.3.6 Inform the teacher when supplies are low.

E4.3.7 Store personal property in designated locations.

CRITERION-REFERENCED MEASURE

C4.3 Laboratory organization procedures followed, with all items on instructor's checklist rated satisfactory.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Tour the laboratory and point out identifying markings on tools that correspond to given areas (E4.3.1).
2. Explain the established procedures for storage of materials and for keeping the laboratory organized (E4.3.1).
3. Identify and discuss the responsibility of the laboratory superintendent (E4.3.2).
4. Have students rotate the responsibility of the laboratory superintendent (E4.3.2).
5. Assist the superintendent in recognizing the responsibilities of keeping the laboratory organized (E4.3.2).
6. Establish a reward system for those students who take pride in having a well organized laboratory (E4.3.3-E4.3.7).

SELECTED TOOLS AND MATERIALS

Instructor-prepared checklist of laboratory organization procedures
List of laboratory superintendent's responsibilities

SELECTED AUDIOVISUAL MATERIALS

Slides: *Developing Shop Safety Skills*. AAVIM
Videotape: *Developing Shop Safety Skills--The Videotape*. McCully and Triplett.

SELECTED REFERENCES

Developing Shop Safety Skills. AAVIM.

----------------Application--------------

DUTY AREA

4. USING THE AGRICULTURAL MECHANICS LAB

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

4.4 Demonstrate and use sound laboratory safety rules

COURSE

Agricultural Science and Mechanics I (8006)

4.4

PERFORMANCE OBJECTIVE

P4.4 Given access to an agricultural mechanics laboratory and information on laboratory safety, demonstrate and use sound laboratory safety rules as established by instructor's checklist. All items on the checklist must be rated acceptable.

SELECTED ENABLING OBJECTIVES

E4.4.1 Identify general safety rules and safety equipment applicable to the laboratory.

E4.4.2 Identify specific safety rules as they apply to different areas of the laboratory.

E4.4.3 Interpret safety signs, symbols, and color codes.

E4.4.4 Distinguish among class A, B, and C fire extinguishers.

E4.4.5 Demonstrate how to operate properly the fire extinguishers located in the laboratory.

E4.4.6 Demonstrate the proper use of tools, equipment, supplies, and personal safety equipment.

E4.4.7 Recognize unsafe and hazardous situations that may occur.

CRITERION-REFERENCED MEASURE

C4.4 Instructor-established laboratory safety rules demonstrated and used according to instructor's checklist, with all items rated acceptable.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students read resource materials on safety and identify the rules and equipment required for a safe working environment (E4.4.1-E4.4.4).
2. Make a list of safety rules that pertain to the laboratory (E4.4.1, 4.4.2).
3. Give demonstrations, arrange visual displays, or present materials on safety rules and equipment as they apply to each tool, machine, or task (E4.4.1-E4.4.7).
4. Have students observe safety rules (E4.4.1, E4.4.2).
5. Have each student pass a test on safety and the correct operation or use of personal safety equipment, laboratory equipment, tools, and supplies (E4.4.1-E4.4.7).
6. Have students report unsafe and hazardous situations as they occur and demonstrate the correct procedures to return the situation to normal (E4.4.7).

SELECTED TOOLS AND MATERIALS

Personal protective devices
Fire extinguishers
Fire blanket
Storage for combustibles
Safety rules and posters
Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

Slides: Developing Shop Safety Skills. AAVIM.
Videotape: Developing Shop Safety Skills--The Videotape. McCully and Triplett.

SELECTED REFERENCES

Developing Shop Safety Skills (text, teacher's guide and student workbook). AAVIM.
Laboratory Safety Handbook. Virginia Department of Education.
Mechanics in Agriculture, Chapter 2. Phipps.
Planning, Organizing, and Teaching Agricultural Mechanics, pp. 59-84. Bear and Hoerner.

DUTY AREA

5. DRAWING AND SKETCHING PLANS FOR AGRICULTURAL MECHANICS

TASKS/COMPETENCIES

5.1 Identify and select equipment and supplies for drawing and sketching

5.2 Draw lines

5.3 Draw views of objects

5.4 Sketch freehand

5.5 Draw a laboratory project plan

----------------Application--------------

DUTY AREA

5. DRAWING AND SKETCHING PLANS FOR AGRICULTURAL MECHANICS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

5.1 Identify and select equipment and supplies for drawing and sketching

COURSE

Agricultural Science and Mechanics I (8006)

5.1

PERFORMANCE OBJECTIVE

P5.1 Given a setting for drawing or sketching in agricultural mechanics, identify and select the proper equipment and supplies required by the given drawing or sketch with 100% accuracy.

SELECTED ENABLING OBJECTIVES

E5.1.1 Explain the values of drawing and sketching.

E5.1.2 Identify equipment and supplies.

E5.1.3 Select equipment and supplies.

E5.1.4 List the purpose of each piece of equipment.

E5.1.5 Identify various activities involving drawing or sketching.

CRITERION-REFERENCED MEASURE

C5.1 Drawing and sketching equipment identified and selected with 100% accuracy according to drawing requirements.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Discuss the values of drawing and sketching (E5.1.1).
2. Discuss the parts of equipment (E5.1.2-E5.1.4).
3. Demonstrate the correct use of supplies and equipment (E5.1.1-E5.1.5).
4. Use catalogs and pictures to illustrate different types of supplies and equipment (E5.1.2, E5.1.3).
5. Look at examples of completed drawings and sketches (E5.1.5).

SELECTED TOOLS AND MATERIALS

Drawing board
T-square
Drawing sheets
Drafting tape
Dividers
Erasing shield
Triangle
Scale
Irregular curves
Protractors
Drafting pencils
Compasses
Others as desired

SELECTED AUDIOVISUAL MATERIALS

Transparencies: ABC's of Drafting. DCA Educational Products.
Basic Drafting: Book Two. Mid-America Vocational Curriculum Consortium.

SELECTED REFERENCES

Basic Drafting: Book Two. Mid-America Vocational Curriculum Consortium.
Mechanics in Agriculture, Chapter 7. Phipps.
Modern Agricultural Mechanics, Chapter 1. Wakeman.
Working in Agricultural Mechanics, Chapter 4. Shinn and Weston.
Shop Tools and Procedures, 8029, Mechanical Drawings and Drawing Equipment. Ohio Curriculum Materials Service.

----------------Application--------------

DUTY AREA

5. DRAWING AND SKETCHING PLANS FOR AGRICULTURAL MECHANICS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

5.2 Draw lines

COURSE

Agricultural Science and Mechanics I (8006)

5.2

PERFORMANCE OBJECTIVE

P5.2 Given drafting tools and supplies, draw the different types of lines used in drawings. Straight lines, circles, and curves must be drawn in thick, medium, and thin widths with a distinct contrast in line weight between each. All lines must be clean, dense, black, and uniform.

SELECTED ENABLING OBJECTIVES

E5.2.1 Identify the alphabet (different types) of lines.

E5.2.2 Select equipment and supplies.

E5.2.3 Demonstrate the correct techniques of drawing a line.

E5.2.4 Draw lines to length.

E5.2.5 Draw lines of the correct weight.

E5.2.6 Draw lines to scale.

E5.2.7 Evaluate quality of lines.

CRITERION-REFERENCED MEASURE

C5.2 Clean, dense, black, and uniform lines drawn as required by the type of drawing.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Using simple drawings, identify the alphabet of lines (E5.2.1).
2. Discuss the relationship between the degree of hardness and the grade rating of graphite lead in drawing pencils (E5.2.5).
3. Give students exercises in measuring and using different scales (E5.2.6).
4. Observe examples of drawings in different scales (E5.2.6).
5. Demonstrate and have students practice drawing different types of lines using different scales (E5.2.2- E5.2.6).
6. Evaluate students' work as they progress (E5.2.7).

SELECTED TOOLS AND MATERIALS

Drawings equipment and supplies
Examples of drawings

SELECTED AUDIOVISUAL MATERIALS

Film: Drafting Methods. University of Illinois Film Center.
Transparencies: ABC's of Drafting. DCA Educational Products.
Blueprint Reading Basics: Group 1--Basics. Hobar.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 1. Wakeman.
Technical Woodworking, Unit 6. Groneman and Glazener.
Working in Agricultural Mechanics, Chapter 6. Shinn and Weston.

DUTY AREA

5. DRAWING AND SKETCHING PLANS FOR AGRICULTURAL MECHANICS

TASK/COMPETENCY

5.3 Draw views of objects

----------------Application-------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

5.3

PERFORMANCE OBJECTIVE

P5.3 Given a pictorial view, objects, or sketches, and the necessary equipment and supplies, draw views (orthographics) of an object. The drawing must completely define the shape of the parts of the object drawn and must meet applicable drafting standards for finished drawings.

SELECTED ENABLING OBJECTIVES

E5.5.1 Describe the procedures for selecting sheet size, scale, and spacing of views.

E5.5.2 Describe the principles of orthographic projection.

E5.5.3 Prepare a three-view detail of a simple object.

E5.5.4 Prepare views of an object with hidden features.

E5.5.5 Prepare a drawing demonstrating the appropriate use of visible, hidden, and center lines.

E5.5.6 Dimension a drawing.

E5.5.7 Describe the importance of checking a finished drawing for accuracy.

E5.5.8 Identify drafting standards for finished drawings.

CRITERION-REFERENCED MEASURE

C5.3 Views of designated object drawn, completely defining shape of the parts of the object and meeting drafting standards for finished drawings.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Explain the principles employed in planning a drawing (E5.3.1-E5.3.8).
2. Provide examples of drawings to use in explaining the principles of orthographic projection (E5.3.1-E5.3.8).
3. Begin with a simple drawing and progress to more complex ones (E5.3.1-E5.3.8).
4. Explain the principles of dimensioning (E5.3.6).
5. Use numerous exercises to develop the ability to interpret a drawing visually by looking at an object and drawing the views (E5.3.1-E5.3.8).
6. Have students check their finished drawings for accuracy (E5.3.7, E5.3.8).

SELECTED TOOLS AND MATERIALS

Examples of orthographic views of objects
Drafting equipment and supplies
Scale replicas of objects to be drawn

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Basic Drafting: Book Two. Mid-America Vocational Curriculum Consortium.
ABC's of Drafting. DCA Educational Products.
Blueprint Reading Basics: Group 2--Orthographic Projection. Hobar.

SELECTED REFERENCES

Basic Drafting: Book Two. Mid-America Vocational Curriculum Consortium.
Modern Agricultural Mechanics, Chapter 1. Wakeman.
Technical Woodworking, Unit 6. Groneman and Glazener.
Vocational Agriculture II--A Curriculum Guide, Section F, Unit I. Oklahoma State Board
Working in Agricultural Mechanics, Chapters 4 and 6. Shinn and Weston.
of Vocational and Technical Education.

DUTY AREA

5. DRAWING AND SKETCHING PLANS FOR AGRICULTURAL MECHANICS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

5.4 Sketch freehand

COURSE

Agricultural Science and Mechanics I (8006)

5.4

PERFORMANCE OBJECTIVE

P5.4 Given the required information for a multiview sketch and basic drafting equipment and supplies, sketch freehand a multiview and pictorial sketch. The sketch must include straight lines, circles, and curves with an accuracy of observation, proper technique, and line quality.

SELECTED ENABLING OBJECTIVES

E5.4.1 List the advantages of freehand sketching.

E5.4.2 Describe the procedures for selecting sheet size, type of paper, scale, and spacing of views.

E5.4.3 Demonstrate the techniques of sketching.

E5.4.4 Prepare a three-view detail of a simple object.

E5.4.5 Prepare a pictorial sketch.

CRITERION-REFERENCED MEASURE

C5.4 Multiview and pictorial sketch drawn freehand, using appropriate equipment and supplies, including straight lines, circles, and curves, and demonstrating accuracy of observation, proper technique, and line quality.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Explain the principles employed in planning a sketch (E5.4.1).
2. Provide examples of sketches to use in explaining the principles of sketching (E5.4.1-E5.4.5).
3. Begin with simple sketches and progress to more complex ones (E5.4.1-E5.4.5).
4. Have students prepare multiview and pictorial sketches (E5.4.1-E5.4.5).

SELECTED TOOLS AND MATERIALS

Examples of sketches (orthographic views)
Sketching equipment and supplies
Scale replicas of objects to be sketched

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Basic Drafting: Book Two. Mid-America Vocational Curriculum Consortium.

SELECTED REFERENCES

Basic Drafting: Book Two. Mid-America Vocational Curriculum Consortium.
Modern Agricultural Mechanics, Chapter 1. Wakeman.

DUTY AREA

5. DRAWING AND SKETCHING PLANS FOR AGRICULTURAL MECHANICS

TASK/COMPETENCY

5.5 Draw a laboratory project plan

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

5.5

PERFORMANCE OBJECTIVE

P5.5 Given a specific project, drawing equipment, and supplies, draw a laboratory project plan. Straight lines, circles, and curves must be drawn in thick, medium, and thin widths with a distinct contrast in line weight between each. All lines must be clean, dense, black, and uniform.

SELECTED ENABLING OBJECTIVES

E5.5.1 Select the correct sheet size, scale, and spacing of views.

E5.5.2 Prepare the orthographic views of the project.

E5.5.3 Prepare a pictorial view of the project.

E5.5.4 Dimension the drawings.

E5.5.5 Check the plan for accuracy.

CRITERION-REFERENCED MEASURE

C5.5 Laboratory project plan drawn, using straight lines, circles, and curves in thick, medium, and thin widths and showing distinct line weight between each.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have the student describe the procedures to use in drawing a laboratory project plan (E5.5.1-E5.5.5).
2. Select a plan applicable to the interest and experiences of the individual student (E5.5.1-E5.5.5).
3. Observe the student and provide guidance when needed (E5.5.1-E5.5.5).
4. Have students look at completed laboratory project plans of former students (E5.5.5).

SELECTED TOOLS AND MATERIALS

Drafting equipment and supplies

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Basic Drafting: Book Two. Mid-America Vocational Curriculum Consortium.

ABC's of Drafting. DCA Educational Products.

SELECTED REFERENCES

Basic Drafting: Book Two. Mid-America Vocational Curriculum Consortium.
Modern Agricultural Mechanics, Chapter 1. Wakeman.
Technical Woodworking, Unit 6. Groneman and Glazener.
Working in Agricultural Mechanics, Chapters 4 and 6. Shinn and Weston.

DUTY AREA

6. IDENTIFYING METALS

TASKS/COMPETENCIES

6.1 Identify metals by physical properties

6.2 Identify metals by spark test

6.3 Identify metals by chip test

6.4 Identify metals by magnetic test

6.5 Identify metals by acid test

DUTY AREA

6. IDENTIFYING METALS

TASK/COMPETENCY

6.1 Identify metals by physical properties

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

6.1

PERFORMANCE OBJECTIVE

P6.1 Given resource materials and several samples of metal, identify metals by physical properties with 100% accuracy according to the guidelines of the instructor.

SELECTED ENABLING OBJECTIVES

E6.1.1 Locate information on the physical properties of metals.

E6.1.2 Describe the surface finish, color, and texture of metals that can be observed by the eye.

E6.1.3 Identify the physical properties of metals from samples.

CRITERION-REFERENCED MEASURE

C6.1 Metals identified by physical properties with 100% accuracy, according to instructor's guidelines.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Illustrate through examples and charts how the physical properties of metals can be observed (E6.1.1-E6.1.3).
2. Have students locate different types of metal in the laboratory (E6.1.2, E6.1.3).

SELECTED TOOLS AND MATERIALS

Metal identification chart (Modern Agricultural Mechanics, pp. 84-85. Wakeman)

Metal samples:
aluminum
magnesium
brass
copper
lead
tin
silver
stainless steel
cast iron
low-carbon steel
medium-carbon steel
high-carbon steel
tool steel

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Identifying and Selecting Metal for Fabrication (LAP). Virginia Vocational Curriculum Center.
Mechanics in Agriculture, pp. 255-257. Phipps.
Modern Agricultural Mechanics, Chapter 4. Wakeman.
Working in Agricultural Mechanics, Chapter 10. Shinn and Weston.
Working in Agricultural Mechanics: Activity Guide and Project Plan Book, Unit IV. Shinn and Weston.

----------------Application--------------

DUTY AREA

6. IDENTIFYING METALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

6.2 Identify metals by spark test

COURSE

Agricultural Science and Mechanics I (8006)

6.2

PERFORMANCE OBJECTIVE

P6.2 Given samples of metal and a grinder, identify metals with 90% accuracy by spark test according to the guidelines of the instructor.

SELECTED ENABLING OBJECTIVES

E6.2.1 Locate a source of information on performing the spark test.

E6.2.2 Identify the color and type of spark.

E6.2.3 Grind the metal and match the proper category of sparks (cast iron, stainless steel, high carbon steel and tool steel, medium carbon steel, or low-carbon steel) with those on spark chart.

CRITERION-REFERENCED MEASURE

C6.2 Metals identified by spark test with 90% accuracy, according to instructor's guidelines.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Describe the color and types of sparks through the use of a chart and a demonstration (E6.2.1-E6.2.3).
2. Review grinder safety practices (E6.2.3).
3. Have students bring in pieces of metal to identify by the spark test (E6.2.3).

SELECTED TOOLS AND MATERIALS

Grinder
Metals identification chart (Modern Agricultural Mechanics, pp. 84-85. Wakeman)
Metal samples:
- aluminum
- magnesium
- brass
- copper
- lead
- tin
- silver
- stainless steel
- cast iron
- low-carbon steel
- medium-carbon steel
- high-carbon steel
- tool steel

SELECTED AUDIOVISUAL MATERIALS

Transparency: Methods of Identifying Metals, p. 61A, Vocational Trade and Industrial Education--Welding. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Identifying and Selecting Metal for Fabrication (LAP). Virginia Vocational Curriculum Center.
Mechanics in Agriculture, pp. 255-257. Phipps.
Modern Agricultural Mechanics, Chapter 4. Wakeman.
Working in Agricultural Mechanics, Chapter 10. Shinn and Weston.
Working in Agricultural Mechanics: Activity Guide and Project Plan Book, Unit IV. Shinn and Weston.

----------------Application--------------

DUTY AREA

6. IDENTIFYING METALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

6.3 Identify metals by chip test

COURSE

Agricultural Science and Mechanics I (8006)

6.3

PERFORMANCE OBJECTIVE

P6.3 Given samples of metal, a chisel, and hammer, identify metals by chip test with 90% accuracy according to the description listed on Figure 4-1 (Wakeman).

SELECTED ENABLING OBJECTIVES

E6.3.1 Locate a source of information on performing the chip test.

E6.3.2 Chip metal with hammer and chisel.

E6.3.3 Compare the chips obtained to the description on the chart (Figure 4-1, Wakeman).

E6.3.4 Determine the type of metal.

CRITERION-REFERENCED MEASURE

C6.3 Metals identified by chip test with 90% accuracy, according to descriptions listed on Figure 4-1 (Wakeman).

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate and have students identify metals by chipping with a chisel (E6.3.1-E6.3.4).
2. Review applicable safety practices (E6.3.2).
3. Have students bring in pieces of metal to identify by the chip test (E6.3.1-E6.3.4).

SELECTED TOOLS AND MATERIALS

Modern Agricultural Mechanics, Figure 4-1. Wakeman.
Hammer
Cold chisel
Metal samples:
- aluminum
- magnesium
- brass
- copper
- lead
- tin
- silver
- stainless steel
- cast iron
- low-carbon steel
- medium-carbon steel
- high-carbon steel
- tool steel

SELECTED AUDIOVISUAL MATERIALS

Transparency: Methods of Identifying Metals, p. 61A, Vocational Trade and Industrial Education--Welding. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Identifying and Selecting Metal for Fabrication (LAP). Virginia Vocational Curriculum Center.
Mechanics in Agriculture, pp. 255-257. Phipps.
Modern Agricultural Mechanics, Chapter 4. Wakeman.
Working in Agricultural Mechanics, Chapter 10. Shinn and Weston.
Working in Agricultural Mechanics: Activity Guide and Project Plan Book, Unit IV. Shinn and Weston.

----------------Application--------------

DUTY AREA

6. IDENTIFYING METALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

6.4 Identify metals by magnetic test

COURSE

Agricultural Science and Mechanics I (8006)

6.4

PERFORMANCE OBJECTIVE

P6.4 Given samples of metal and a magnet, identify metals by using the magnet with 100% accuracy, according to the description listed on Figure 4-1 (Wakeman).

SELECTED ENABLING OBJECTIVES

E6.4.1 Differentiate between magnetic and non-magnetic metals.

E6.4.2 Touch a magnet to a piece of metal and determine if it is magnetic or non-magnetic.

E6.4.3 Identify the category (magnetic or non-magnetic) to which the metals belong.

CRITERION-REFERENCED MEASURE

C6.4 Metals identified by magnetic test with 100% accuracy, according to description listed on Figure 4-1 (Wakeman).

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students classify samples of metals as magnetic or non-magnetic (E6.4.1-E6.4.3).
2. Have students identify metals at home that are magnetic and non-magnetic (E6.4.1-E6.4.3).

SELECTED TOOLS AND MATERIALS

Metal identification chart (Modern Agricultural Mechanics, pp. 84-85. Wakeman.)
Magnet
Metal samples:
aluminum
magnesium
brass
copper
lead
tin
silver
stainless steel
cast iron
low-carbon steel
medium-carbon steel
high-carbon steel
tool steel

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Identifying and Selecting Metal for Fabrication (LAP). Virginia Vocational Curriculum Center.
Mechanics in Agriculture, pp. 255-257. Phipps.
Modern Agricultural Mechanics, Chapter 4. Wakeman.
Working in Agricultural Mechanics, Chapter 10. Shinn and Weston.
Working in Agricultural Mechanics: Activity Guide and Project Plan Book, Unit IV. Shinn and Weston.

DUTY AREA

6. IDENTIFYING METALS

TASK/COMPETENCY

6.5 Identify metals by acid test

--------------------Application--------------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

6.5

PERFORMANCE OBJECTIVE

P6.5 Given samples of metal and a cup of vinegar, identify metals by acid test with 100% accuracy.

SELECTED ENABLING OBJECTIVES

E6.5.1 List the metals that will react to vinegar.

E6.5.2 Place a small amount of vinegar on a sample of metal and determine if a reaction is obtained.

E6.5.3 Identify the category to which each metal belongs.

CRITERION-REFERENCED MEASURE

C6.5 Metals identified by acid test with 100% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Explain what causes metal to react to acid (E6.5.1).
2. Have students determine metals to which vinegar reacts (E6.5.1-E6.5.3).

SELECTED TOOLS AND MATERIALS

Metal identification chart (Modern Agricultural Mechanics, pp. 84-85. Wakeman.)
Vinegar or acetic acid
Metal samples:
- aluminum
- magnesium
- brass
- copper
- lead
- tin
- silver
- stainless steel
- cast iron
- low-carbon steel
- medium-carbon steel
- high-carbon steel
- tool steel

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Identifying and Selecting Metal for Fabrication (LAP). Virginia Vocational Curriculum Center.
Mechanics in Agriculture, pp. 255-257. Phipps.
Modern Agricultural Mechanics, Chapter 4. Wakeman.
Working in Agricultural Mechanics, Chapter 10. Shinn and Weston.
Working in Agricultural Mechanics: Activity Guide and Project Plan Book, Unit IV. Shinn and Weston.

DUTY AREA

7. PERFORMING HOT METALWORKING OPERATIONS

TASKS/COMPETENCIES

7.1 Interpret hot metalworking plans

7.2 Identify hot metalworking tools, equipment, and supplies

7.3 Heat metal

7.4 Anneal ferrous metal

7.5 Harden ferrous metal

7.6 Temper ferrous metal

7.7 Shape metal

7.8 Construct an approved hot metalworking project

DUTY AREA

7. PERFORMING HOT METALWORKING OPERATIONS

TASK/COMPETENCY

7.1 Interpret hot metalworking plans

----------------Application-------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (3006)

7.1

PERFORMANCE OBJECTIVE

P7.1 Given hot metalworking plans, interpret the plans with 90% accuracy by identifying views, dimensions, lines, abbreviations, and symbols used on the plan and by identifying needed tools and materials.

SELECTED ENABLING OBJECTIVES

E7.1.1 Identify views, dimensions, abbreviations, and symbols used.

E7.1.2 Identify tools and materials needed.

E7.1.3 Identify skills needed to complete project.

E7.1.4 Estimate cost of project.

E7.1.5 Estimate time to complete project.

CRITERION-REFERENCED MEASURE

C7.1 Hot metalworking plans interpreted with 90% accuracy, including identification of views, dimensions, lines, abbreviations, symbols, and necessary tools and materials.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies needed for agricultural mechanics (E7.1.3).
2. Have students identify selected information from plans (E7.1.1, E7.1.2).
3. Have students prepare a bill of materials from the hot metalworking plans (E7.1.4).

SELECTED TOOLS AND MATERIALS

Hot metalworking plans
Assignment sheet #1--Read and Interpret a Drawing, pp. 19F-22F, Vocational Agricultural II--A Curriculum Guide. Oklahoma State Board of Vocational and Technical Education.

SELECTED AUDIOVISUAL MATERIALS

Transparency: Types of Dimensions on a Drawing, p. 11F, Vocational Agriculture II--A Curriculum Guide. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Modern Agricultural Mechanics, pp. 21-23. Wakeman.
Vocational Agriculture II--A Curriculum Guide, Section F, Unit I. Oklahoma State Board of Vocational and Technical Education.

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DUTY AREA

7. PERFORMING HOT METALWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

7.2 Identify hot metalworking tools, equipment, and supplies

COURSE

Agricultural Science and Mechanics I (8006)

7.2

PERFORMANCE OBJECTIVE

P7.2 Given hot metalworking tools, equipment and supplies, identify with 90% accuracy the tools, equipment, and supplies on a written or oral quiz.

SELECTED ENABLING OBJECTIVES

E7.2.1 Select tools, equipment, and supplies used in hot metalworking.

E7.2.2 Describe the uses of hot metalworking tools, equipment, and supplies.

CRITERION-REFERENCED MEASURE

C7.2 Hot metalworking tools, equipment, and supplies identified with 90% accuracy on a written or oral quiz.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate and describe the uses of hot metalworking tools, equipment, and supplies (E7.2.1, E7.2.2).
2. Have students identify hot metalworking tools, equipment, and supplies (E7.2.1, E7.2.2).
3. Have students use hot metalworking tools (E7.2.1, E7.2.2).

SELECTED TOOLS AND MATERIALS

Small steel square
Hardy
Tuller
Swage
Flatter
T-bevel
Heat treatment chart
Sledge
Rivet tongs
Bolt tongs
Straight lip tongs
Round punch
Square punch
Cold cutter
Hot cutter
Blacksmith's hammer
Sand
Vermiculite
Water
Heat sources

Tool identification kit (Interstate)

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Shop Tool Identification. University of Illinois.
Film: Hand Tools for Metal Work (48912). Virginia Department of Education.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 15. Phipps.
Modern Agricultural Mechanics, Chapter 5. Wakeman.
Working In Agricultural Mechanics, Chapter 14. Shinn and Weston.
Working in Agricultural Mechanics: Activity Guide and Project Plan Book, Unit IV. Shinn and Weston.

DUTY AREA

7. PERFORMING HOT METALWORKING OPERATIONS

TASK/COMPETENCY

7.3 Heat metal

-----------------Application-----------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and
Mechanics I (8990)

7.3

PERFORMANCE OBJECTIVE

P7.3 Given metal and a heat source, heat metal to the specifications given by the instructor.

SELECTED ENABLING OBJECTIVES

E7.3.1 Identify sources of heat.

E7.3.2 Identify the parts and components of each heat source available.

E7.3.3 Compare the qualities of each heat source.

E7.3.4 Select the appropriate heat source for a given job.

E7.3.5 Identify safety practices to follow for each heat source.

E7.3.6 Explain how to operate each source of heat.

E7.3.7 Demonstrate the proper use of each heat source.

CRITERION-REFERENCED MEASURE

C7.3 Metal heated according to instructor specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students read and study each heat source available in the laboratory (E7.3.1-E7.3.3).
2. Give a demonstration, audiovisual presentation, and/or written materials on each heat source as it applies to specific tasks (E7.3.1-E7.3.7)
3. Have each student pass a test on the safety and use of each heat source (E7.3.5-E7.3.7).
4. Have each student demonstrate the proper use of each heat source (E7.3.7).

SELECTED TOOLS AND MATERIALS

All available sources of heat
Hot metalworking tools
Metal to heat

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 15. Phipps.
Modern Agricultural Mechanics, Chapter 5. Wakeman.
Working in Agricultural Mechanics, Chapter 14. Shinn and Weston.

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DUTY AREA

7. PERFORMING HOT METALWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

7.4 Anneal ferrous metal

COURSE

Agricultural Science and Mechanics I (8006)

7.4

PERFORMANCE OBJECTIVE

P7.4 Given ferrous metal and hot metalworking tools, equipment, and supplies, anneal ferrous metal. The metal must be soft with no evidence of overheating damage.

SELECTED ENABLING OBJECTIVES

E7.4.1 Identify ferrous metal (Duty Area 6).

E7.4.2 Define anneal.

E7.4.3 Identify temperature of metal by color.

E7.4.4 Describe the annealing process.

E7.4.5 Identify safety practices to follow.

E7.4.6 Select the source of heat.

E7.4.7 Heat metal to proper temperature in a furnace or with other heat sources.

E7.4.8 Place metal in vermiculite or sand.

E7.4.9 File metal to determine if it is soft.

CRITERION-REFERENCED MEASURE

C7.4 Ferrous metal annealed, metal soft, with no evidence of overheating damage.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Refer to Duty Area 6 for identifying ferrous metal (E7.4.1).
2. Demonstrate and explain the annealing process, giving examples of annealing different types of ferrous metal (E7.4.2-E7.4.9).
3. Have students complete safety instruction and test knowledge on hot metalworking (E7.4.5).
4. Have students practice the procedure until proficient (E7.4.2-E7.4.9).

SELECTED TOOLS AND MATERIALS

Container of pour-type vermiculite or sand
Hot metalworking tools
Heat treatment color chart
Heat source
Metal for annealing

SELECTED AUDIOVISUAL MATERIALS

Film: Forge and Ornamental Iron (82609). Virginia Department of Education.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 5. Wakeman.
Working in Agricultural Mechanics, Chapter 14. Shinn and Weston.

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DUTY AREA

7. PERFORMING HOT METALWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND
MECHANICS

TASK/COMPETENCY

7.5 Harden ferrous metal

COURSE

Agricultural Science and
Mechanics I (8996)

7.5

PERFORMANCE OBJECTIVE

P7.5 Given ferrous metal and hot metalworking tools, equipment, and supplies, [illegible] ferrous metal. The metal must be hard with no evidence of overheating [illegible]

SELECTED ENABLING OBJECTIVES

E7.5.1 Identify ferrous metal (Duty Area 6).

E7.5.2 Define hardness.

E7.5.3 Identify temperatures of metal by color.

E7.5.4 Describe the hardening process.

E7.5.5 Identify safety practices to follow.

E7.5.6 Select the source of heat.

E7.5.7 Heat metal to proper temperature in a furnace or with other heat sources.

E7.5.8 Cool metal in warm water.

E7.5.9 File metal to determine if it is hard.

CRITERION-REFERENCED MEASURE

C7.5 Ferrous metal hardened with no evidence of overheating damage.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Refer to Duty Area 6 for identifying ferrous metal (E7.5.1).
2. Demonstrate the hardening process (E7.5.2-E7.5.9).
3. Explain the chemical process of hardening steel (E7.5.2-E7.5.9).
4. Present safety instruction and test students on their knowledge of using hot metalworking tools and equipment (E7.5.5).
5. Have students practice the procedure until proficient (E7.5.2-E7.5.9).

SELECTED TOOLS AND MATERIALS

Container of warm water
Hot metalworking tools
Heat treatment color chart
Heat source
Metal for hardening

SELECTED AUDIOVISUAL MATERIALS

Film: Forge and Ornamental Iron (82609). Virginia Department of Education.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 5. Wakeman.
Working in Agricultural Mechanics, Chapter 14. Shinn and Weston.

DUTY AREA

7. PERFORMING HOT METALWORKING OPERATIONS

TASK/COMPETENCY

7.6 Temper ferrous metal

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

7.6

PERFORMANCE OBJECTIVE

7.6 Given ferrous metal and hot metalworking tools, equipment, and supplies, temper ferrous metal. The metal must be the desired hardness and toughness as indicated by instructor's specifications.

SELECTED ENABLING OBJECTIVES

E7.6.1 Identify ferrous metal (Duty Area 6)

E7.6.2 Define temper.

E7.6.3 Identify temperature of metal by color.

E7.6.4 Describe the tempering process.

E7.6.5 Identify safety practices to follow.

E7.6.6 Harden the metal in a furnace or by using other heat sources (see Task 7.5).

E7.6.7 Reheat the metal to the proper temperature.

E7.6.8 Cool the metal slowly, or quench in warm water.

CRITERION-REFERENCED MEASURE

C7.6 Ferrous metal tempered to desired hardness and toughness of instructor's specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Refer to Duty Area 6 for identifying ferrous metal (E7.6.1)
2. Demonstrate the tempering process. Use a cold chisel to illustrate the various stages of heat treatment (E7.6.2-E7.6.8).
3. Explain the chemical process of tempering steel (E7.6.4, E7.6.6-E7.6.8).
4. Verify that students have received and passed a test on safety instruction in hot metal work (E7.6.5).
5. Have students temper metal projects (E7.6.1-E7.6.8).

SELECTED TOOLS AND MATERIALS

Container of dry sand
Hot metalworking tools
Heat treatment color chart
Heat source
Metal for tempering

SELECTED AUDIOVISUAL MATERIALS

Film: Forge and Ornamental Iron (82609). Virginia Department of Education.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 5. Wakeman.
Working in Agricultural Mechanics, Chapter 14. Shinn and Weston.

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DUTY AREA

7. PERFORMING HOT METALWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

7.7 Shape metal

COURSE

Agricultural Science and Mechanics I (8006)

7.7

PERFORMANCE OBJECTIVE

P7.7 Given plans with specifications, metal, hot metalworking tools, equipment, and supplies, shape metal. The metal must conform to the conditions and tolerances in the specifications.

SELECTED ENABLING OBJECTIVES

E7.7.1 Interpret the specifications and plans.

E7.7.2 Identify the type and quality of metal to use.

E7.7.3 Select the proper tools, equipment, and supplies.

E7.7.4 Describe how to shape (bend, twist, cut, square, draw-out, upset, and punch) metal.

E7.7.5 Determine the heat treatment requirement.

E7.7.6 Identify safety practices to follow.

E7.7.7 Select the source of heat.

E7.7.8 Heat metal to the correct temperature.

E7.7.9 Verify the correctness of measurements.

CRITERION-REFERENCED MEASURE

C7.7 Metal shaped, conforming to the conditions and tolerances in the specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Refer to Task 7.1 for interpretation of plans (E7.7.1).
2. Refer to Duty Area 6 for identification of metals (E7.7.2).
3. Demonstrate and have students practice shaping metal (E7.7.3-E7.7.8).
4. Verify that students have received and passed safety instruction in hot metal work (E7.7.6).
5. Have students shape metal projects (E7.7.1-E7.7.9).
6. Have students verify measurements (E7.7.9).

SELECTED TOOLS AND MATERIALS

Hot metalworking tools, equipment, and supplies
Heat source
Plans and specifications
Metal for bending

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Bench Metalwork Series--Bending and Shaping. Bergwall Productions, Inc.

SELECTED REFERENCES

Laboratory Safety Handbook, p. 16-17. Virginia Department of Education.
Mechanics in Agriculture, Chapter 15. Phipps.
Modern Agricultural Mechanics, Chapter 5. Wakeman.
Working in Agricultural Mechanics, Chapter 14. Shinn and Weston.

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DUTY AREA

7. PERFORMING HOT METALWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

7.8 Construct an approved hot metalworking project

COURSE

Agricultural Science and Mechanics I (8006)

7.8

PERFORMANCE OBJECTIVE

P7.8 Given an assignment to construct a hot metalworking project, project metal, hot metalworking tools, equipment, and supplies, construct an approved hot metalworking project. Project must be approved by the instructor and conform to the plans and specifications.

SELECTED ENABLING OBJECTIVES

E7.8.1 Select or draw a plan for a hot metal project.

E7.8.2 Interpret hot metalworking plans (Task 7.1).

E7.8.3 Select the proper tools, equipment, and supplies.

E7.8.4 Estimate the cost and time to complete the project.

E7.8.5 Describe the types of hot metalworking operations to be used.

E7.8.6 Identify the safety practices to follow.

E7.8.7 Verify the correctness of measurements.

CRITERION-REFERENCED MEASURE

C7.8. Instructor-approved hot metalworking project constructed, conforming to plans and specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies needed for agricultural mechanics (E7.8.1, E7.8.2).
2. Have students list tools and materials needed (E7.8.3).
3. Have students describe procedures to use (E7.8.3, E7.8.4).
4. Verify that students have passed a safety test and are able to perform the required competencies (E7.8.5-E7.8.6)).
5. Plan metalworking projects to coincide with students' supervised occupational experience programs (E7.8.1-E7.8.7).
6. Observe and provide assistance when needed (E7.8.1-E7.8.7).

SELECTED TOOLS AND MATERIALS

Hot metalworking tools, equipment, and supplies
Metal (as required by plans)
Heat source

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Agricultural Mechanics Plans. Hobar.
Mechanics in Agriculture, Chapter 15. Phipps.
Modern Agricultural Mechanics, Chapter 5. Wakeman.
Working in Agricultural Mechanics, Chapter 14. Shinn and Weston.

DUTY AREA

8. RECONDITIONING AGRICULTURAL TOOLS

TASKS/COMPETENCIES

8.1 Interpret tool-fitting plans

8.2 Identify and select tools, equipment, and supplies for tool fitting

8.3 Make a tool-fitting template

8.4 Use the grinder to sharpen tools

8.5 Clean and preserve tools

8.6 Fit tools with handles

8.7 Recondition an agricultural mechanic tool

DUTY AREA

8. RECONDITIONING AGRICULTURAL TOOLS

TASK/COMPETENCY

8.1 Interpret tool-fitting plans

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

8.1

PERFORMANCE OBJECTIVE

P8.1 Given tool-fitting plans for reconditioning a tool, interpret the tool-fitting plans with 90% accuracy by identifying views, dimensions, lines, abbreviations, and symbols used on the plan, identifying needed tools and materials, and estimating time and cost.

SELECTED ENABLING OBJECTIVES

E8.1.1 Identify views, dimensions, lines, abbreviations, and symbols used on the plans.

E8.1.2 Identify tools and materials needed for the project.

E8.1.3 Estimate cost of reconditioning.

E8.1.4 Identify skills needed to recondition tools.

E8.1.5 Estimate time to complete.

CRITERION-REFERENCED MEASURE

C8.1 Tool-fitting plans interpreted by identifying with 90% accuracy the views, dimensions, lines, abbreviations, and symbols used on the plan, identifying needed tools and materials, and estimating time and cost.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display reconditioned tools with plans used (E8.1.1, E8.1.2).
2. Review drawing and sketching competencies needed for agricultural mechanics (E8.1.1).
3. Have students identify selected information from plans (E8.1.1, E8.1.2).
4. Have students identify the tools, materials, and skills needed (E8.1.2-E8.1.4).
5. Have students estimate cost and time required to recondition a tool (E8.1.3, E8.1.5).

SELECTED TOOLS AND MATERIALS

Tool-fitting plans
Assignment sheet #1--Read and Interpret a Drawing, pp. 19F - 22F, Vocational Agriculture II--A Curriculum Guide. Oklahoma State Board of Vocational and Technical Education.

SELECTED AUDIOVISUAL MATERIALS

Transparency: Types of Dimensions on a Drawing, p. 11-F, Vocational Agriculture II--A Curriculum Guide. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Modern Agricultural Mechanics, pp. 21-23. Wakeman.
Vocational Agriculture II--A Curriculum Guide, Section F, Unit I. Oklahoma State Board of Vocational and Technical Education.

DUTY AREA

8. RECONDITIONING AGRICULTURAL TOOLS

TASK/COMPETENCY

8.2 Identify and select tools, equipment, and supplies for tool fitting

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

8.2

PERFORMANCE OBJECTIVE

P8.2 Given selected agricultural tools needing reconditioning, identify and select with 90% accuracy the tools, equipment, and supplies needed for tool fitting.

SELECTED ENABLING OBJECTIVES

E8.2.1 Identify and select the correct sizes and types of tools, equipment, and supplies.

E8.2.2 Describe the desirable qualities of tools, equipment, and supplies needed for tool fitting.

CRITERION-REFERENCED MEASURE

C8.2 Tools, equipment, and supplies needed for tool fitting identified and selected with 90% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the correct tools, equipment, and supplies needed (E8.2.1).
2. Have students describe the desirable qualities of tools, equipment, and supplies for tool fitting (E8.2.2)

SELECTED TOOLS AND MATERIALS

Tool grinder
Tool template
Oilstone
Oil
Try-square
Files

SELECTED AUDIOVISUAL MATERIALS

Slides: Fundamental Skill Development Guide. Caterpillar Tractor Co.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 5. Phipps.
Modern Agricultural Mechanics, Chapter 3. Wakeman.
Shop Tools and Procedures. Ohio Curriculum Materials Service.
Working in Agricultural Mechanics, Unit VII. Shinn and Weston.

DUTY AREA

8. RECONDITIONING AGRICULTURAL TOOLS

TASK/COMPETENCY

8.3 Make a tool-fitting template

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

8.3

PERFORMANCE OBJECTIVE

P8.3 Given adequate supplies and equipment, make a tool-fitting template. The angles of the template must match the accuracy of the template used as a guide and must be free from burrs, jagged edges, slivers, and runouts.

SELECTED ENABLING OBJECTIVES

E8.3.1 Select the tools, equipment, and supplies.

E8.3.2 Identify the safety practices to follow.

E8.3.3 Draw or trace the angles on the template.

E8.3.4 Cut the proper angles.

E8.3.5 Verify the corrections of the angles.

E8.3.6 Deburr the edges of the angles.

E8.3.7 Stamp the appropriate angles on the template.

E8.3.8 Apply a finish or preservative, if necessary.

CRITERION-REFERENCED MEASURE

C8.3 Tool-fitting template made, matching the quality of the template used as a guide and free of burrs, jagged edges, slivers, and runouts.

SELECTED INSTRUCTIONAL ACTIVITIES

1. List the advantages of using a tool-fitting template (E8.3.1-E8.3.8).
2. Demonstrate and have students make a template (E8.3.1-E8.3.8).
3. Have the students observe the work of a sheet metal worker, if one is available (E8.3.1-E8.3.8).

SELECTED TOOLS AND MATERIALS

Sheet metal or tin
Scratch awl
Snips
Preservative
Template
Combination square
T-bevel or protractor
Steel lettered and numbered stamps

SELECTED AUDIOVISUAL MATERIALS

Filmstrips: Sheet Metal Fabrication. Hobar.
Transparencies: Sheet Metal Hand Tools. Hobar.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 3. Wakeman.

DUTY AREA

8. RECONDITIONING AGRICULTURAL TOOLS

TASK/COMPETENCY

8.4 Use the grinder to sharpen tools

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

8.4

PERFORMANCE OBJECTIVE

P8.4 Given dull tools and a grinder, use the grinder to sharpen tools. All safety precautions must be observed. Tools must be ground to the proper angle, show a single grinding mark on each bevel, and show no evidence of overheating.

SELECTED ENABLING OBJECTIVES

E8.4.1 Describe the safety practices to follow.

E8.4.2 Attach and align toolrest and tongue guard.

E8.4.3 Select the proper wheel for the job.

E8.4.4 Inspect the grinding wheel for damage and proper operation.

E8.4.5 Observe safety precautions.

E8.4.6 Dress and true the grinding wheel.

E8.4.7 Describe the procedures to sharpen different types of agricultural tools.

CRITERION-REFERENCED MEASURE

C8.4 Grinder used to sharpen tools, all safety precautions observed, tools ground to proper angle, showing a single grinding mark on each bevel and no evidence of overheating.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the proper adjustment and use of the grinder (E8.4.1-E8.4.7).
2. Have students score 100% on a safety test for a grinder (E8.4.1, E8.4.5).
3. Have students bring in tools and sharpen them on the grinder (E8.4.1-E8.4.7).

SELECTED TOOLS AND MATERIALS

Grinder
Dull tools
Oilstone
Template
Combination square

SELECTED AUDIOVISUAL MATERIALS

Slides: School Shop Safety. AAVIM.

SELECTED REFERENCES

Machine Shop, P.O. #72. V-TECS.
Mechanics in Agriculture, Chapter 5. Phipps.
Modern Agricultural Mechanics, Chapter 3. Wakeman.
Occupational Safety and Health in Vocational Education, p. 135. National Institute for Occupational Safety and Health.
Shop Tools and Procedures. Ohio Curriculum Materials.
Working in Agricultural Mechanics, Unit VII. Shinn and Weston.

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DUTY AREA

8. RECONDITIONING AGRICULTURAL TOOLS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

8.5 Clean and preserve tools

COURSE

Agricultural Science and Mechanics I (8006)

8.5

PERFORMANCE OBJECTIVE

P8.5 Given supplies and tools to be cleaned and preserved, select the proper supplies and clean and preserve tools. Tools must be clean, rust free, and show evidence of preservative application.

SELECTED ENABLING OBJECTIVES

E8.5.1 Identify the composition of tools.

E8.5.2 Select the correct materials and procedures to use in cleaning and preserving tools.

E8.5.3 Clean selected tools.

E8.5.4 Preserve tools.

CRITERION-REFERENCED MEASURE

C8.5 Tools cleaned and preserved using proper supplies, tools clean, rust free, and showing evidence of preservative application.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the advantages and disadvantages of using different methods and materials to clean and preserve different types of tools (E8.5.1, E8.5.2).
2. Have students bring in tools to clean and preserve (E8.5.3, E8.5.4).
3. If applicable, have students clean and preserve tools used in their supervised occupational experience programs (E8.5.1-E8.5.4).

SELECTED TOOLS AND MATERIALS

Water
600 grit wet or dry silicone carbide paper
Powdered pumice
Oil
Varnish or other wood finish
Cleaning solvent

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 3. Wakeman.
Shop Tools and Procedures. Ohio Curriculum Materials Service.

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DUTY AREA

8. RECONDITIONING AGRICULTURAL TOOLS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

8.6 Fit tools with handles

COURSE

Agricultural Science and Mechanics I (8006)

8.6

PERFORMANCE OBJECTIVE

P8.6 Given the necessary equipment, supplies, and tools needing a handle, fit tools with handles. The balance of the tool will be maintained, and the handle will taper neatly into the eye of the tool.

SELECTED ENABLING OBJECTIVES

E8.6.1 Select the necessary tools and supplies.

E8.6.2 Remove the old handle.

E8.6.3 Recondition the eye, if necessary.

E8.6.4 Fit the new handle.

E8.6.5 Apply finish.

CRITERION-REFERENCED MEASURE

C8.6 Tools fitted with handles, the balance of each tool maintained and the handle tapered neatly into the eye of the tool.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Describe the advantages and disadvantages of different types of wood used for handles (E8.6.1).
2. Show examples of poor choices of wood used in handles (E8.6.1).
3. Demonstrate the correct procedure for replacing handles in tools (E8.6.2-E8.6.4).
4. Have students bring in tools to replace handles (E8.6.2-E8.6.4).
5. Demonstrate the types of finishes used on handles, and have students apply the proper finish (E8.6.5).

SELECTED TOOLS AND MATERIALS

Tools needing handles:

axes
hammer
shovels
forks
hatchets
wood rasp
bit brace
twist drill bits
wood chisel
vise
hacksaw
chain drill
punch
cold chisel
half-round wood file
wallet
ripsaw
ruler
chalk or starch
boiled linseed oil
pine wedges
metal wedges
file
pictures depicting poor quality wood used in handles

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Fundamental Skill Development Guide. Caterpillar Tractor Co.
Mechanics in Agriculture, Chapter 5. Phipps.
Shop Tools and Procedures. Ohio Curriculum Materials Service.

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DUTY AREA

8. RECONDITIONING AGRICULTURAL TOOLS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

8.7 Recondition an agricultural mechanic tool

COURSE

Agricultural Science and Mechanics I (8006)

8.7

PERFORMANCE OBJECTIVE

P8.7 Given the necessary equipment, supplies, and tools needing reconditioning, recondition an agricultural mechanic tool. The reconditioned tool must conform to the specifications given by the instructor.

SELECTED ENABLING OBJECTIVES

E8.7.1 Identify and select the proper tools, equipment, and supplies.

E8.7.2 Estimate the cost and time to complete the reconditioning.

E8.7.3 Describe the procedures for reconditioning the tool.

E8.7.4 Identify the safety practices to follow.

E8.7.5 Apply preservative to the tool.

CRITERION-REFERENCED MEASURE

C8.7 Agricultural mechanic tool reconditioned according to instructor's specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review competencies needed to recondition agricultural mechanic tools (E8.7.1-E8.7.5).
2. Have students list tools, materials, and supplies needed (E8.7.1).
3. Have students describe procedures to use (E8.7.3, E8.7.4).
4. Verify that students have passed a safety test and are able to perform the required competencies (E8.7.4, E8.7.5).
5. Have students recondition tools used in their supervised occupational experience programs (E8.7.1-E8.7.5).

SELECTED TOOLS AND MATERIALS

Tool grinder
Tool template
Oilstone
Oil
Try-square
Files
Dull tools

SELECTED AUDIOVISUAL MATERIALS

Slides: Fundamentals Skill Development Guide. Caterpillar Tractor Co.

SELECTED REFERENCES

Machine Shop. V-TECS.
Mechanics in Agriculture, Chapter 5. Phipps.
Modern Agricultural Mechanics, Chapter 3. Wakeman.
Shop Tools and Procedures. Ohio Curriculum Materials Service.
Working in Agricultural Mechanics, Unit VII. Shinn and Weston.

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

TASKS/COMPETENCIES

9.1 Interpret cold metalworking plans

9.2 Identify cold metalworking tools, equipment, and supplies

9.3 Measure and lay out metal

9.4 Cut metal with a hacksaw

9.5 Cut metal with a cold chisel

9.6 Cut metal with abrasive cut-off wheel or saw

9.7 Operate bolt cutter

9.8 Drill metal with drill press

9.9 Tap threads

9.10 Cut threads

9.11 Finish metal with a file

9.12 Construct an approved cold metalworking project

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

TASK/COMPETENCY

9.1 Interpret cold metalworking plans

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

9.1

PERFORMANCE OBJECTIVE

P.9.1 Given cold metalworking plans, interpret the cold metalworking plans by identifying views, dimensions, abbreviations, and symbols used on the plans and by identifying tools and materials needed (all with 90% accuracy).

SELECTED ENABLING OBJECTIVES

E9.1.1 Describe the shape of the object(s) on the plan.

E9.1.2 Identify views, dimensions, lines, abbreviations, and symbols used.

E9.1.3 Identify materials needed to complete the project.

CRITERION-REFERENCED MEASURE

C9.1 Cold metalworking plans interpreted by identifying views, dimensions, abbreviations, and symbols used on the plans and by identifying the tools and materials needed to complete the project (all with 90% accuracy).

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies needed in agricultural mechanics (E9.1.1).
2. Define key concepts related to working drawings (E9.1.1).
3. Have students examine samples of working drawings and describe their characteristics and use (E9.1.1-E9.1.3).
4. Have students prepare a bill of materials from the cold metalworking plans (E9.1.3).

SELECTED TOOLS AND MATERIALS

Cold metalworking plans
Assignment sheet #1: Read and Interpret a Drawing, pp. 19F - 22F, Vocational Agriculture II--A Curriculum Guide. Oklahoma State Board of Vocational and Technical Education.

SELECTED AUDIOVISUAL MATERIALS

Transparency: Types of Dimensions on a Drawing, p. 11F. Vocational Agriculture II--A Curriculum Guide. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Modern Agricultural Mechanics, pp. 21-23. Wakeman.
Vocational Agriculture II--A Curriculum Guide, Section F, Unit I. Oklahoma State Board of Vocational and Technical Education.

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

TASK/COMPETENCY

9.2 Identify cold metalworking tools, equipment, and supplies

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

9.2

PERFORMANCE OBJECTIVE

P9.2 Given a selection of cold metalworking tools, equipment, and supplies, identify the cold metalworking tools, equipment and supplies with 90% accuracy on an oral or written quiz.

SELECTED ENABLING OBJECTIVES

E9.2.1 Identify devices used in measuring and marking cold metal (hammers, scriber, scratch awl, flat file, soapstone or chalk, punch, compass, dividers, calipers, micrometer, steel tape, and squares).

E9.2.2 Identify tools and equipment used for cutting metal (cold chisels, hacksaw, cut-off wheel, bolt cutter, tinner's snips, metal shears, and metal band saw).

E9.2.3 Identify tools and equipment used for bending and shaping cold metal (bending fork and vise).

E9.2.4 Identify tools, equipment, and supplies used in tapping and cutting threads (drill press, drill bits, cutting fluids, tap wrench, and T-handle).

E9.2.5 Identify types of files.

CRITERION-REFERENCED MEASURE

C9.2 Cold metalworking tools, equipment, and supplies identified with 90% accuracy on an oral or written quiz..

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate the uses of cold metalworking tools, equipment, and supplies (E9.2.1-E9.2.5).

2. Have students use references to identify the names of cold metalworking tools, equipment, and supplies (E9.2.1-E9.2.5).

3. Test students' ability to identify tools, equipment, and supplies after actual use (E9.2.1-E9.2.5).

4. Use the Metal Craftsman's Handbook to verify correct definitions and spelling of terms (E9.2.1-E9.2.5).

SELECTED TOOLS AND MATERIALS

Hammers
Scriber
Scratch awl
Soapstone
Chalk
Punch
Compass
Dividers
Calipers
Micrometer
Steel tape
Cold chisels
Hacksaw
Vise
Cut-off wheel
Bolt cutter
Tinner's snipe
Metal-shears
Metal band saw
Bending fork
Drill press
Drill bits
Cutting oil
Tap wrench
T-handle

SELECTED AUDIOVISUAL MATERIALS

Transparency: Shop Tool Identification. University of Illinois.
Film: Hand Tools for Metal Work (48912). Virginia Department of Education.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 4. Phipps.
Metal Craftsman's Handbook. AAVIM.
Modern Agricultural Mechanics, Chapter 6. Wakeman.
Shop Tools and Procedures. Ohio Curriculum Materials Service.
Working in Agricultural Mechanics, Chapters 11-13. Shinn and Weston.

----------------Application--------------

DUTY AREA

9. PERFORM COLD METALWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

9.3 Measure and lay out metal

COURSE

Agricultural Science and Mechanics I (8006)

9.3

PERFORMANCE OBJECTIVE

E9.3 Given measuring and layout instructions and the necessary metal, measure and lay out metal within a tolerance of ±1/32".

SELECTED ENABLING OBJECTIVES

E9.3.1 Identify and select the required measuring and marking devices.

E9.3.2 Identify the safety practices to be followed.

E9.3.3 Describe the procedures for using each measuring and marking device.

E9.3.4 Use the measuring and marking devices to lay out the metal.

E9.3.5 Verify the correctness of the layout.

CRITERION-REFERENCED MEASURE

C9.3 Metal measured and laid out within a tolerance of ±1/32".

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display measuring and marking devices (E9.3.1).
2. Demonstrate and explain the use of each device (E9.3.1-E9.3.3).
3. Have students measure and lay out metal for a project (E9.3.4, E9.3.5).

SELECTED TOOLS AND MATERIALS

Metal project plans
Hammers
Scribe
Scratch awl
Flat file
Soapstone or chalk
Punch

Squares
Metal for project
Dividers
Calipers
Micrometer
Steel tape
Compass

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 4. Phipps.
Modern Agricultural Mechanics, Chapter 6. Wakeman.

----------------Application--------------

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

9.4 Cut metal with a hacksaw

COURSE

Agricultural Science and Mechanics I (8006)

9.4

PERFORMANCE OBJECTIVE

P9.4 Given hacksaw blades (14, 18, and 32 teeth per inch), hacksaw frame holding device, specifications, and metal, cut metal with a hacksaw. The cut will be along scribed lines and free of burrs.

SELECTED ENABLING OBJECTIVES

E9.4.1 Identify parts of the hacksaw.

E9.4.2 Identify safety practices to follow.

E9.4.3 Select the correct blade.

E9.4.4 Mount the blade in the hacksaw.

E9.4.5 Secure the metal.

E9.4.6 Verify the correctness of the cut.

CRITERION-REFERENCED MEASURE

C9.4 Metal cut with a hacksaw along scribed lines, burrs removed from the cut edge.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students label the parts of a hacksaw on a handout or poster (E9.4.1).
2. Demonstrate and explain the correct use of the hacksaw (E9.4.2-E9.4.6).
3. Provide an assortment of hacksaw blades, and let students discover which metal samples are best cut with a particular blade (E9.4.3-E9.4.6).
4. Have students select from the following exercises:
   a. Cut an iron rod to a specified length;
   b. Cut a 1" strip of metal from a sheet that is 1/16" thick;
   c. Make a square cut from flat stock (E9.4.1-E9.4.6).

SELECTED TOOLS AND MATERIALS

Cold metalworking plans
Combination square
Hacksaw blades
Hacksaw frame
Samples of metal
Vise
Wooden blocks
File
Scriber

SELECTED AUDIOVISUAL MATERIALS

Film: Hand Tools for Metal Work (48912). Virginia Department of Education.

SELECTED REFERENCES

Mechanics in Agriculture, pp. 96-98, 233-323. Phipps.
Modern Agricultural Mechanics, Chapter 6. Wakeman.
Shop Tools and Procedures. Ohio Curriculum Materials Service.
Vocational Agriculture Student Farm Shop Manual, Chapter 6. Pynnonen.
Working in Agricultural Mechanics, Chapter 11. Shinn and Weston.

----------------Application--------------

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

TASK/COMPETENCY

9.5 Cut metal with a cold chisel

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

9.5

PERFORMANCE OBJECTIVE

P9.5 Given cold chisels, hammers, and different metal samples, cut metal with a cold chisel, according to the specifications of the instructor.

SELECTED ENABLING OBJECTIVES

E9.5.1 Identify the different kinds of cold chisels by the shape of the cutting edge.

E9.5.2 Identify safety practices to follow.

E9.5.3 Determine the angle of the cutting edge.

E9.5.4 Cut thin metal and round iron.

E9.5.5 Remove tight bolts or rivets.

CRITERION-REFERENCED MEASURE

C9.5 Metal cut with a cold chisel according to the specifications of the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students identify the four type of cold chisels on a handout or poster (E9.5.1).
2. Provide all five types of cold chisels and metal samples, and allow students to discover which chisels are best to cut a particular piece of metal (E9.5.2-E9.5.5).
3. Have students select from the following exercises:
   a. Cut an iron rod to a specified length;
   b. Cut a 1" strip of metal from a sheet that is 1/16" thick;
   c. Shear thin flat metal stock (E9.5.1-E9.5.5).

SELECTED TOOLS AND MATERIALS

Flat chisel
Cape chisel
Diamond point chisel
Half round nose chisel
Round nose chisel
Vise
Machinist's hammer
Anvil
Rusty bolt
Rusty bolt in metal
Rivets set in metal

SELECTED AUDIOVISUAL MATERIALS

Film: Hand Tools for Metal Work (48912). Virginia Department of Education.

SELECTED REFERENCES

Mechanics in Agriculture, pp. 98-99. Phipps.
Metal Craftsman's Handbook, p. 34. AAVIM.
Modern Agricultural Mechanics, pp. 121-122. Wakeman.
Working in Agricultural Mechanics, Chapter 13. Shinn and Weston.

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

TASK/COMPETENCY

9.6 Cut metal with abrasive cut-off wheel or saw

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

9.6

PERFORMANCE OBJECTIVE

P9.6 Given a stock cut-off machine and metal workpiece, cut metal with abrasive cut-off wheel or saw to scribed lines and job specifications.

SELECTED ENABLING OBJECTIVES

E9.6.1 Identify stock cut-off machine by type, size, nomenclature, and range of work.

E9.6.2 Identify safety practices to follow.

E9.6.3 Identify, select, and mount cut-off wheel or saw.

E9.6.4 Adjust and clamp saw guide.

E9.6.5 Determine and set correct cutting speed.

E9.6.6 Select and secure appropriate holding device (if necessary).

CRITERION-REFERENCED MEASURE

C9.6 Metal cut with abrasive cut-off wheel or saw to scribed lines and job specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students identify the key parts and accessories of a stock cut-off machine: power hacksaw, horizontal hand saw, abrasive cut-off (E9.6.1).
2. Have students compile a list of safety precautions to follow and pass a safety test on the cut-off machine (E9.6.2).
3. Demonstrate how to cut metal using the abrasive cut-off wheel or saw (E9.6.1-E9.6.6).
4. Have students practice (under supervision) cutting metal with the abrasive cut-off wheel or saw (E9.6.1-E9.6.6).

SELECTED TOOLS AND MATERIALS

Abrasive cut-off saw
Metal to cut

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Bench Metalworking Series. Bergwall Productions, Inc.
Film: Power Hacksaw and Bandsaw (55709). Virginia Department of Education.

SELECTED REFERENCES

Modern Agricultural Mechanics, pp. 138-141. Wakeman.
Working in Agricultural Mechanics, Chapter 11. Shinn and Weston.

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

9.7 Operate bolt cutter

COURSE

Agricultural Science and Mechanics I (8006)

9.7

PERFORMANCE OBJECTIVE

P9.7 Given bolts, rods, and other small metal made of wrought iron and low carbon steel, operate a bolt cutter to cut bolts and rods neatly and where specified by the instructor.

SELECTED ENABLING OBJECTIVES

E9.7.1 Identify the size and capacity of a bolt cutter.

E9.7.2 Identify safety practices to follow.

E9.7.3 Adjust and/or replace cutter.

E9.7.4 Describe the characteristics of metal for which bolt cutters are applicable.

E9.7.5 Select the appropriate size bolt cutters for the job.

E9.7.6 Treat bolt cutters for rust prevention.

CRITERION-REFERENCED MEASURE

C9.7 Bolt cutter operated to cut bolts and rods neatly and where specified by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display different sizes of bolt cutters (E9.7.1).
2. Demonstrate how to use and maintain bolt cutters (E9.7.1-E9.7.6).
3. Have students describe the characteristics of metal for which bolt cutters can be used (E9.7.4).
4. Have students select the correct size bolt cutters and use and maintain bolt cutters (E9.7.1-E9.7.6).

SELECTED TOOLS AND MATERIALS

Bolts and rods to cut
Bolt cutter
Lubricant

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Modern Agricultural Mechanics, p. 123. Wakeman.

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

TASK/COMPETENCY

9.8 Drill metal with drill press

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

9.8

PERFORMANCE OBJECTIVE

P9.8 Given a drill press, drills, and metal, drill metal with drill press. Drill press must be operated safely, and holes must be drilled without heat damage to bits.

SELECTED ENABLING OBJECTIVES

E9.8.1 Identify parts of the drill press.

E9.8.2 Identify safety practices to follow and pass a safety test on the operation and safe use of the drill press.

E9.8.3 Identify and demonstrate the use of work holding devices.

E9.8.4 Select the correct size drill bit.

E9.8.5 Secure sleeve and/or bit to the press.

E9.8.6 Select the correct speed for size bit.

E9.8.7 Identify the type of material to be drilled.

E9.8.8 Center punch hole locations.

E9.8.9 Operate the drill press and accessories.

E9.8.10 Use cutting oil.

E9.8.11 Deburr hole.

CRITERION-REFERENCED MEASURE

C9.8 Metal drilled safely with the drill press without heat damage to bits.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the proper use of the drill press (E9.8.1-E9.8.11).
2. Have students pass an identification, use, and safety test on the drill press (E9.8.1, E9.8.2).
3. Have students practice drilling holes in wood before using metal (E9.8.1-E9.8.11).
4. Supervise student practice (E9.8.1-E9.8.11).

SELECTED TOOLS AND MATERIALS

Metal (flat)
Drill press
Metalworking vise
Straight shank twist drill bits
Tapered shank twist drill bits
Wooden blocks
Cutting oil
Hammer
Center punch
Drill chuck and key
Drill drift
Drill gauge
Drill sleeves

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: The Drill Press Explained Series. Bergwall Production, Inc.
Films: Drill Press (81009). Virginia Department of Education.
Drill Press--Basic Holding Techniques (79604). Virginia Department of Education.

SELECTED REFERENCES

Laboratory Safety Handbook. Virginia Department of Education.
Mechanics in Agriculture, pp. 105-111. Phipps.
Modern Agricultural Mechanics, pp. 364-370. Wakeman.

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

TASK/COMPETENCY

9.9 Tap threads

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

9.9

PERFORMANCE OBJECTIVE

P.9.9 Given a tap set, lubricant, and metal stock, tap threads in the metal. Threads must have the correct number of threads per inch and show no damage. Tap set should show no damage.

SELECTED ENABLING OBJECTIVES

E9.9.1 Identify components of the tap set.

E9.9.2 Define terms associated with screw threads.

E9.9.3 Identify safety practices to follow.

E9.9.4 Drill the correct size hole for tapping.

E9.9.5 Select the proper size tap.

E9.9.6 Mount tap in tap wrench.

E9.9.7 Use cutting oil.

E9.9.8 Deburr hole.

E9.9.9 Verify the quality of tapped threads.

CRITERION-REFERENCED MEASURE

C9.9 Threads tapped with correct number of threads per inch without damage to threads or to tap set.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students examine and identify the components of a tap set (E9.9.1).
2. Have students determine pitch with the screw pitch gauge (E9.9.2).
3. Demonstrate and have students practice tapping threads (E9.9.3-E9.9.9).
4. Compare tapped threads with threads on purchased nuts (E9.9.9).
5. Use bolts to verify the correct size threads (E9.9.9).

SELECTED TOOLS AND MATERIALS

Tap set
Vise
Screw pitch gauge
Cutting oil
Drill press
Drill bits
Metal stock
Rule

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Bench Metalwork Series. Bergwall Productions, Inc.

SELECTED REFERENCES

Modern Agricultural Mechanics, pp. 131-133. Wakeman.
Working in Agricultural Mechanics, Chapter 12. Shinn and Weston.

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

9.10 Cut threads

COURSE

Agricultural Science and Mechanics I (8006)

9.10

PERFORMANCE OBJECTIVE

P9.10 Given a die set, lubricant, and round metal stock, cut threads on the round stock. Threads must have the correct number of threads per inch and show no damage. Die set should show no damage.

SELECTED ENABLING OBJECTIVES

E9.10.1 Identify components of the tap set.

E9.10.2 Define terms associated with screw threads.

E9.10.3 Identify safety practices to follow.

E9.10.4 Select the proper size die.

E9.10.5 Mount die in diestock.

E9.10.6 Bevel the end of the round stock.

E9.10.7 Square the diestock to the round stock.

E9.10.8 Use cutting oil .

E9.10.9 Verify the threaded stock.

CRITERION-REFERENCED MEASURE

C9.10 Threads cut having the correct threads per inch without damage to threads or to the die set.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students examine and identify the components of a die set (E9.10.1).
2. Have students determine pitch with the screw pitch gauge (E9.10.2).
3. Demonstrate and have students practice cutting threads (E9.10.3-E9.10.9).
4. Compare cut threads with threads on purchased bolts (E9.10.9).
5. Use nuts to verify the correct size threads (E9.10.9).

SELECTED TOOLS AND MATERIALS

Die set
Vise
Screw pitch gauge
Cutting oil
Round metal stock
Rule

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Bench Metalworking Series. Bergwall Productions, Inc.

SELECTED REFERENCES

Modern Agricultural Mechanics, pp. 134-135. Wakeman.
Working in Agricultural Mechanics, Chapter 12. Shinn and Weston.

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

TASK/COMPETENCY

9.11 Finish metal with a file

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

9.11

PERFORMANCE OBJECTIVE

P9.11 Given an assortment of files, file handles, file card and brush, and workpiece, finish metal with a file to shape workpiece according to the directions of the instructor.

SELECTED ENABLING OBJECTIVES

E9.11.1 Identify the parts and shapes of commonly used files.

E9.11.2 Describe the uses of different types of files.

E9.11.3 Attach the handle to the file.

E9.11.4 Clean the file.

E9.11.5 Insert the workpiece in a holding device.

E9.11.6 File material in a safe manner to the final tolerance.

CRITERION-REFERENCED MEASURE

C9.11 Metal finished with a file according to the directions of the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students examine the different types of files, and identify the parts and shapes of files (E9.11.1).
2. Demonstrate the proper methods of holding the file and workpiece (E9.11.2).
3. Have students clean files (E9.11.4).
4. Have students practice straight filing and draw filing (E9.11.3-E9.11.6):
   a. File a surface flat and straight on a piece of metal;
   b. File the surface of a round rod.

SELECTED TOOLS AND MATERIALS

Round and flat metal stock
File card and brush
File handles
Files (assorted)
Square

SELECTED AUDIOVISUAL MATERIALS

Film: Hand Tools for Metal Works (48912). Virginia Department of Education.
Filmstrip: Bench Metalwork Series. Bergwall Productions, Inc.

SELECTED REFERENCES

Mechanics in Agriculture, pp. 94-96. Phipps.
Modern Agriculture Mechanics, pp. 124-126. Wakeman.
Working in Agricultural Mechanics, pp. 123-126. Shinn and Weston.

DUTY AREA

9. PERFORMING COLD METALWORKING OPERATIONS

TASK/COMPETENCY

9.12 Construct an approved cold metalworking project

----------------Application----------------

PROGRAM

AGRICULTURE SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

9.12

PERFORMANCE OBJECTIVE

P9.12 Given a cold metal project, project metal, cold metalworking tools, equipment, and supplies, construct an approved cold metalworking project. Project must be approved by the instructor and conform to the plans and specifications.

SELECTED ENABLING OBJECTIVES

E9.12.1 Select or draw a plan for a cold metal project.

E9.12.2 Interpret cold metalworking plans (Task 8.1).

E9.12.3 Select the proper tools, equipment, and supplies.

E9.12.4 Estimate the cost and time to complete the project.

E9.12.5 Describe the types of cold metalworking operations to be used.

E9.12.6 Identify safety practices to follow.

E9.12.7 Verify the correctness of measurements.

CRITERION-REFERENCED MEASURE

C9.12 Instructor-approved cold metalworking project constructed according to plans and specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies for agricultural mechanics (E9.12.1, E9.12.2).
2. Have students list tools and materials needed (E9.12.3).
3. Have students describe procedures to use (E9.12.3, E9.12.4).
4. Verify that students have passed a safety test and are able to perform the required competencies (E9.12.5, E9.12.6).
5. Plan metalworking projects to coincide with students' supervised occupational experience programs (E9.12.1-E9.12.7).
6. Observe and provide assistance when needed (E9.12.1-E9.12.7).

SELECTED TOOLS AND MATERIALS

Cold metalworking tools, equipment, and supplies
Metal (as required by plans)

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Agricultural Mechanics Plans. Hobar.
Mechanics in Agriculture, Chapter 16. Phipps.
Modern Agricultural Mechanics, Chapter 6. Wakeman.
Vocational Agriculture Student Farm Shop Manual, Chapter 6. Pynnonen.
Working in Agricultural Mechanics, Chapter 13. Shinn and Weston.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASKS/COMPETENCIES

10.1 Interpret arc welding plans

10.2 Identify arc welding tools, equipment, and supplies

10.3 Demonstrate safe use of arc welding equipment

10.4 Select electrodes

10.5 Select amperage for a given job

10.6 Prepare metal for welding

10.7 Strike and establish an arc

10.8 Start, stop, and restart an arc weld bead

10.9 Perform downhand welding

10.10 Construct an approved arc welding project

10.11 Explain natural phenomena (principles) involved in arc welding

10.12 Control excess distortion, warping, and cracking during welding

10.13 Perform vertical-down welding

10.14 Perform horizontal welding

10.15 Perform vertical-up welding

10.16 Perform overhead welding

10.17 Hardsurface metal with an arc welder

10.18 Cut metal with an arc welder

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.1 Interpret arc welding plans

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

10.1

PERFORMANCE OBJECTIVE

P10.1 Given arc welding plans, interpret arc welding plans by identifying with 90% accuracy the views, dimensions, lines, abbreviations and symbols used on the plans and by identifying materials needed with 100% accuracy.

SELECTED ENABLING OBJECTIVES

E10.1.1 Identify views, dimensions, abbreviations, and symbols on the arc welding plans.

E10.1.2 Identify materials needed to complete the project.

CRITERION-REFERENCED MEASURE

C10.1 Arc welding plans interpreted by identifying with 90% accuracy the views, dimensions, lines, abbreviations, and symbols used on the plans, and by identifying with 100% accuracy the materials needed.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies (Duty Area 5) needed in agricultural mechanics (E10.1.1).
2. Define key concepts related to working drawings (E10.1.1).
3. Have students examine samples of arc welding plans and describe their characteristics and use (E10.1.1).
4. Have students prepare a bill of materials from the plans (E10.1.2).

SELECTED TOOLS AND MATERIALS

Arc welding plans
Assignment sheet #1: Read and Interpret a Drawing, pp. 19F - 22F, Vocational Agriculture II--A Curriculum Guide. Oklahoma State Board of Vocational and Technical Education.

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Types of Dimensions on a Drawing, p. 11F, Vocational Agriculture II--A Curriculum Guide. Oklahoma State Board of Vocational and Technical Education.

Basic Welding Symbols, p. 17F, Vocational Agriculture II--A Curriculum Guide. Oklahoma State Board of Vocational and Technical Education.

Welding Symbols, in Basic Arc and Welding Symbols. Latta.

SELECTED REFERENCES

Blueprint Reading for Welders (Instructor's Guide, wall charts, and transparencies). Hobar.
How to Read Shop Drawings. The Lincoln Electric Company.
Modern Agricultural Mechanics, pp. 21-23. Wakeman.
Vocational Agriculture II--A Curriculum Guide, Section F, Unit I. Oklahoma State Board of Vocational and Technical Education.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.2 Identify arc welding tools, equipment, and supplies

---------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

10.2

PERFORMANCE OBJECTIVE

P10.2 Given a selection of arc welding tools, equipment, and supplies, correctly identify with 90% accuracy the tools, equipment, and supplies on an oral or written quiz.

SELECTED ENABLING OBJECTIVES

E10.2.1 Select tools, equipment, and supplies used in arc welding.

E10.2.2 Describe the uses and functions of arc welding tools, equipment, and supplies.

E10.2.3 Name the parts of each tool and piece of equipment.

CRITERION-REFERENCED MEASURE

C10.2 Arc welding tools, equipment, and supplies identified with 90% accuracy on an oral or written quiz.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate the uses of arc welding tools, equipment, and supplies (E10.2.2).
2. Have students use references to identify the names of arc welding tools, equipment, and supplies (E10.2.3).
3. Test students' ability to identify tools, equipment, and supplies after using (E10.2.1-E10.2.3).
4. Have students prepare a list of arc welding tools, equipment, and supplies available at home or in their SOEPs (E10.2.1-E10.2.3).

SELECTED TOOLS AND MATERIALS

Welding machine
Electronic holder with lead
Ground clamp with lead
Shield or helmet
Gloves
Chipping hammers
Safety goggles
Wire brush
Electrodes
Pliers
Protective clothing
Soapstone
C-clamp

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Arc Welding, W-9, W-10, W-11. Hobar.
AC Welder. Latta
Welder's Dress. Latta.
Accessories. Latta.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Modern Agricultural Mechanics, Chapter 7. Wakeman.

----------------Application--------------

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

10.3 Demonstrate safe use of arc welding equipment

COURSE

Agricultural Science and Mechanics I (8006)

10.3

PERFORMANCE OBJECTIVE

P10.3 Given arc welding tools, equipment, and supplies, demonstrate safe use of arc welding equipment by following all safety procedures, with all items on an instructor-prepared checklist rated acceptable.

SELECTED ENABLING OBJECTIVES

E10.3.1 Identify safety rules and safety equipment applicable to arc welding.

E10.3.2 Recognize unsafe and hazardous situations that occur and report them to the instructor.

E10.3.3 Pass a safety test on arc welding.

CRITERION-REFERENCED MEASURE

C10.3 Safe use of arc welding equipment demonstrated by following all safety procedures, all items on an instructor-prepared checklist rated acceptable.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students read resource materials on safety and identify the rules and equipment required for safe arc welding (E10.3.1-E10.3.3).
2. Make a list of safety rules for arc welding (E10.3.1).
3. Emphasize safety when demonstrating and presenting materials on arc welding (E10.3.1, E10.3.2).
4. Present information on what has happened when safe practices have not been followed (E10.3.2).
5. Have each student pass a test on safety and the correct operation and use of arc welding equipment (E10.3.3).
6. Have students report unsafe and hazardous situations as they occur (E10.3.2).

SELECTED TOOLS AND MATERIALS

Safety rules for arc welding
Welding helmet
Protective clothing
Safety goggles
Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Welder's Dress. Latta.
Filmstrip/Cassette: Electric Arc Welding. Bergwall Productions, Inc.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 7. Wakeman.
Occupational Safety and Health in Vocational Education, pp. 146-147. Godbey.
Shielded Metal-Arc Welding, Topic 2. Hobart School of Welding Technology.
Shop Safety Skills, Teacher Guide, p. 25. AAVIM.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.4 Select electrodes

Application

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

10.4

PERFORMANCE OBJECTIVE

E10.4 Given an arc welding project, select electrodes according to the type and thickness of metal, weld positions, and type of weld to produce the result specified.

SELECTED ENABLING OBJECTIVES

E10.4.1 Identify the parts of an electrode.

E10.4.2 Describe the functions of each part of the electrode.

E10.4.3 Explain the electrode classification system.

E10.4.4 Determine the type of electrode needed based on the type and thickness of metal.

E10.4.5 Select electrodes according to the welding position.

CRITERION-REFERENCED MEASURE

C10.4 Electrodes selected according to the type and thickness of metal, weld position, and type of weld to be used to produce the result specified.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate different types of electrodes (E10.4.1-E10.4.3).
2. Have students select electrodes for different types of welding jobs (E10.4.4, E10.4.5).

SELECTED TOOLS AND MATERIALS

Electrodes (various types)
Electrode selection chart

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Electrode Coatings. Latta.
AWS Classification of Electrodes, p. 51F, Vocational Agriculture Education I. Oklahoma State Board of Vocational and Technical Education.
Color Codes, W-15. Hobar.
Mild Steel Electrode Selection, W-30. Hobar.
Electrode Chart, W-16. Hobar.
Electrode Coatings, W-45. Hobar.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Modern Agricultural Mechanics, Chapter 7. Wakeman.
Shielded Metal-Arc Welding, Topic 12. Hobart School of Welding Technology.
Working in Agricultural Mechanics, Chapter 16. Shinn and Weston.

--------------Application--------------

DUTY AREA

10 PERFORMING ARC WELDING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

10.5 Select amperage for a given job

COURSE

Agricultural Science and Mechanics I (8006)

10.5

PERFORMANCE OBJECTIVE

P10.5 Given a welding exercise and characteristics of correct amperage selection, select amperage as suggested by the electrode manufacturer and adjust amperage up or down according to characteristics of the bead produced. Final selection must produce a bead with the characteristics specified.

SELECTED ENABLING OBJECTIVES

E10.5.1 Measure the thickness of metal.

E10.5.2 Set amperage according to that suggested by the electrode manufacturer.

E10.5.3 Describe the characteristics of beads welded with the correct amperage, amperage too low, and amperage too high.

E10.5.4 Increase or decrease amperage, if necessary.

CRITERION-REFERENCED MEASURE

C10.5 Amperage selected for a given job according to that suggested by the electrode manufacturer, amperage adjusted up or down according to the observed characteristics of the bead produced.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students set amperage according to that recommended by the electrode manufactured for the given size metal (E10.5.1, E10.5.2).
2. Display example welds with varying amperages (E10.5.3).
3. Have students describe the characteristics of their weld (E10.5.3).
4. Have students practice welding different types of exercises and adjust amperage as needed (E10.5.4).

SELECTED TOOLS AND MATERIALS

Measuring tool
Examples of beads with varying degrees of amperage
Manufacturer's recommended amperage chart
Electrode
Welder

SELECTED AUDIOVISUAL MATERIALS

Transparency: Properly and Improperly Formed Beads, p. 47F, Vocational Agriculture Education II, Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Modern Agricultural Mechanics, Chapter 7. Wakeman.

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DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

10.6 Prepare metal for welding

COURSE

Agricultural Science and Mechanics I (8006)

10.6

PERFORMANCE OBJECTIVE

P10.6 Given a welding exercise and metal, prepare metal for welding. The metal must be free from slag, scale, rust, grease, and paint. Joints over 1/8" thick must be beveled and placed in position to weld.

SELECTED ENABLING OBJECTIVES

E10.6.1 Identify safety practices to follow.

E10.6.2 Identify and remove slag, scale, rust, grease, and paint.

E10.6.3 Bevel metal joints over 1/18" thick.

E10.6.4 Place or clamp metal in position.

E10.6.5 Demonstrate safe use of arc welding equipment (P10.3).

CRITERION-REFERENCED MEASURE

C10.6 Metal prepared for welding by removing slag, scale, rust, grease, and paint, joints over 1/18" thick bevelled.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate how to remove safely the slag, scale, rust, grease, and paint from metal (E10.6.1, E10.6.2).
2. Explain the purpose of beveling joints (E10.6.3).
3. Have students clean, bevel, and place metal in position for welding (E10.6.1-E10.6.5).

SELECTED TOOLS AND MATERIALS

Grinder
Wire brush
Scraper
Solvent
Measuring tool
Protective clothing
Face shield
Pliers or tongs

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Metal Craftsman's Handbook. AAVIM.
Modern Agricultural Mechanics, Chapter 7. Wakeman.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.7 Strike and establish an arc

----------------Application---------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

10.7

PERFORMANCE OBJECTIVE

P10.7 Given metal and welding equipment, strike and establish an arc without allowing the electrode to stick to the metal.

SELECTED ENABLING OBJECTIVES

E10.7.1 Identify safety practices to follow.

E10.7.2 Set up metal and welding equipment (P10.6).

E10.7.3 Set amperage (P10.5)

E10.7.4 Strike arc.

E10.7.5 Describe and analyze the procedure used.

E10.7.6 Demonstrate safe use of arc welding equipment (P10.3).

CRITERION-REFERENCED MEASURE

C10.7 Arc struck and established without allowing the electrode to stick to the metal.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate both methods of striking an arc (E10.7.1-E10.7.6).
2. Have students work in groups of two, use short electrodes, practice without the welder turned on, and then practice under normal conditions (E10.7.1-E10.7.6).
3. Evaluate individual performance (E10.7.5).

SELECTED TOOLS AND MATERIALS

Used electrodes
Welding equipment
Scrap metal
Protective clothing

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Striking the Arc. Bergwall Productions, Inc.
Transparency: Striking the Arc, W-17. Hobar.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Modern Agricultural Mechanics, Chapter 7. Wakeman.
Shielded Metal Arc Welding, Topic 3. Hobart School of Welding Technology.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.8 Start, stop, and restart an arc weld bead

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

10.8

PERFORMANCE OBJECTIVE

P10.8 Given welding equipment and supplies, start, stop, and restart an arc weld bead. The bead must blend together without bumps and depressions.

SELECTED ENABLING OBJECTIVES

E10.8.1 Identify safety practices to follow.

E10.8.2 Assemble equipment and supplies.

E10.8.3 Select amperage.

E10.8.4 Strike and establish an arc (P10.7).

E10.8.5 Preheat in vertical position.

E10.8.6 Angle electrode in direction of travel.

E10.8.7 Maintain correct arc length and speed.

E10.8.8 Weld a short bead and stop.

E10.8.9 Join new bead to previous bead.

E10.8.10 Remove slag.

E10.8.11 Evaluate weld bead.

E10.8.12 Demonstrate safe use of arc welding equipment (P10.3).

CRITERION-REFERENCED MEASURE

C10.8 Arc weld bead started, stopped, and restarted without leaving bumps or depressions.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the correct procedures (E10.8.1-E10.8.12).
2. Have students work in groups of two and practice and evaluate the welding procedures and products of each other (E10.8.1-E10.8.12).
3. Evaluate qualities of weld bead (E10.8.11).

SELECTED TOOLS AND MATERIALS

Welding equipment
Protective clothing
3/16" mild steel plate
1/8" E6011 or E6013 electrodes

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Electrode Movement, W-31. Hobar.
Weaving, W-19. Hobar.
Terms Applied to a Weld, W-32. Hobar.
Arc Welding Bead Faults, W-20. Hobar.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 7. Wakeman.
Shielded Metal Arc Welding, Topic 3. Hobart School of Welding Technology.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.9 Perform downhand welding

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

10.9

PERFORMANCE OBJECTIVE

P10.9 Given welding equipment and supplies, perform downhand welding. Weld bead must be smooth, regular, and uniform without undercutting, excess overlapping, or piling up.

SELECTED ENABLING OBJECTIVES

E10.9.1 Identify safety practices to follow.

E10.9.2 Assemble equipment and supplies.

E10.9.3 Select amperage.

E10.9.4 Strike and establish an arc.

E10.9.5 Preheat in vertical position.

E10.9.6 Angle electrode in direction of travel.

E10.9.7 Maintain correct arc length and speed.

E10.9.8 Weld a bead.

E10.9.9 Remove slag.

E10.9.10 Evaluate safe use of arc welding.

E10.9.11 Demonstrate safe use of arc welding equipment (P10.3).

CRITERION-REFERENCED MEASURE

C10.9 Downhand welding performed that is smooth, regular, and uniform without excess undercutting, overlapping, or piling up.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the correct procedure for downhand welding (E10.9.1-E10.9.11).
2. Have students practice laying beads with pliers and pencil--Wakeman, Fig. 7-14 (E10.9.1-E10.9.11).
3. Have students work in groups of two, practice welding, and evaluate the welding procedures and products of each other (E10.9.1-E10.9.11).
4. Evaluate qualities of the downhand weld (E10.9.10).

SELECTED TOOLS AND MATERIALS

Welding equipment
Protective clothing
3/16" mild steel plate
1/8" E6011 or E6013 electrodes

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/Cassette: Arc Welding in the Flat Position. Bergwall Productions, Inc.
Transparencies: Weaving, W-19. Hobar.
Arc Welding Bead Faults, W-20. Hobar.
Electrode Movement, W-31. Hobar.
Terms Applied to a Weld, W-32. Hobar.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Modern Agricultural Mechanics, Chapter 7. Wakeman.
Shielded Metal Arc Welding, Topic 3. Hobart School of Welding Technology.
Working in Agricultural Mechanics: Activity Guide and Project Plan Book. Shinn and Weston.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.10 Construct an approved arc welding project

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

10.10

PERFORMANCE OBJECTIVE

P10.10 Given an assignment to construct an arc welding project, project metal, welding equipment and supplies, construct an approved arc welding project. Project must be approved by the instructor and conform to the plans and specifications.

SELECTED ENABLING OBJECTIVES

E10.10.1 Select or draw a plan for an arc welding project.

E10.10.2 Interpret arc welding plans (P10.1).

E10.10.3 Select the needed tools, equipment, and supplies.

E10.10.4 Estimate the cost and time to complete the project.

E10.10.5 Describe the types of skills needed.

E10.10.6 Identify safety practices to follow.

E10.10.7 Verify the correctness of measurements and quality of weld beads.

E10.10.8 Demonstrate safe use of arc welding equipment (P10.3).

CRITERION-REFERENCED MEASURE

C10.10 Instructor-approved arc welding project constructed conforming to the plans and specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies for agricultural mechanics (E10.10.1, E10.10.2)
2. Have students list tools, equipment, and supplies (E10.10.3).
3. Have students describe procedures to use (E10.10.4, E10.10.5).
4. Verify that students have passed a safety test and are able to perform the required competencies (E10.10.6).
5. Plan arc welding projects to coincide with supervised occupational experience programs (E10.10.1-E10.10.8).
6. Observe and provide assistance when needed (E10.10.1-E10.10.8).

SELECTED TOOLS AND MATERIALS

Arc welding project plans
Welding equipment
Protective clothing
Metal (as required by plans)

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Agricultural Mechanics Plans. Hobar.
Vo-Ag Welding Project Plans. Illinois.
Vocational Agriculture Student Farm Shop Manual, Chapter 13. Pynnonen

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.11 Explain natural phenomena (principles) involved in arc welding

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

10.11

PERFORMANCE OBJECTIVE

P10.11 Given the necessary references, tools, equipment, and supplies, explain with 90% accuracy the natural phenomena (principles) of arc welding. The explanation should include defining terms, identifying basic welding joints, explaining the fundamentals involved, and giving advantages of arc welding over other methods of joining metals.

SELECTED ENABLING OBJECTIVES

E10.11.1 Define terms associated with arc welding.

E10.11.2 Identify the basic welding joints.

E10.11.3 Explain the fundamentals of arc welding.

E10.11.4 Give the advantages of arc welding over other methods of joining metal.

CRITERION-REFERENCED MEASURE

C10.11 Natural phenomena (principles) involved in arc welding explained with 90% accuracy by defining terms, identifying welding joints, explaining fundamentals, and giving advantages of arc welding over other methods of joining metal.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students read and give examples of where arc welding is used (E10.11.1-E10.11.4).
2. Explain and demonstrate what happens in arc welding (E10.11.1-E10.11.4).
3. Compare arc welding to other methods of joining metal (E10.11.4).

SELECTED TOOLS AND MATERIALS

Arc welding tools, equipment, and supplies
Examples of welds
Head shields

SELECTED AUDIOVISUAL MATERIALS

Transparencies: What is Arc Welding?, W-1. Hobar.
Why Weld?, W-6. Hobar.
Welding Process, p. 53F, Vocational Agriculture Education I. Oklahoma State Board of Vocational and Technical Education.
Filmstrip/Cassette: Introduction to AC Arc Welding. Bergwall Productions, Inc.

SELECTED REFERENCES

Metal Craftsman's Handbook. AAVIM.
Shielded Metal Arc Welding, Topic 1. Hobart School of Welding Technology.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.12 Control excess distortion, warping, and cracking during welding

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

10.12

PERFORMANCE OBJECTIVE

P10.12 Given the necessary equipment and exercises to complete, control excess distortion, warping, and cracking during welding by using techniques demonstrated by the instructor.

SELECTED ENABLING OBJECTIVES

E10.12.1 Define distortion, warping, and cracking.

E10.12.2 Describe the causes of distortion, warping, and cracking.

E10.12.3 Describe how to control distortion, warping, and cracking on different sizes of metal.

E10.12.4 Identify safety practices to follow.

CRITERION-REFERENCED MEASURE

C10.12 Excess distortion, warping, and cracking during welding controlled by using techniques demonstrated by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate examples of distortion, warping, and cracking (E10.12.1-E10.12.4).
2. Using several examples, explain the causes and remedies that should have been used to control distortion, warping, and cracking (E10.12.2).
3. Have students identify distortion, warping, and cracking during welding exercises (E10.12.3).

SELECTED TOOLS AND MATERIALS

Welding equipment
Examples of weld distortion, warping, and cracking

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Distortion, W-37. Hobar.
Welding Stresses, W-44. Hobar.
Cracked Welds, W-38. Hobar.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Metal Craftsman's Handbook. AAVIM.
Modern Agricultural Mechanics, p. 164. Wakeman.
Shielded Metal Arc Welding, Topic 22. Hobart School of Welding Technology.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.13 Perform vertical-down welding

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

10.13

PERFORMANCE OBJECTIVE

P10.13 Given welding equipment and supplies, perform vertical-down welding. Weld bead must be smooth, regular, and uniform without undercutting, overlapping, or running.

SELECTED ENABLING OBJECTIVES

E10.13.1 Identify safety practices to follow.

E10.13.2 Assemble equipment and supplies.

E10.13.3 Select amperage.

E10.13.4 Strike and establish an arc.

E10.13.5 Angle electrode.

E10.13.6 Maintain correct arc length and speed.

E10.13.7 Weld a bead.

E10.13.8 Remove slag.

E10.13.9 Evaluate weld bead.

E10.13.10 Demonstrate safe use of arc welding equipment (P10.3).

CRITERION-REFERENCED MEASURE

C10.13 Vertical-down welding performed, welding smooth, regular, and uniform without undercutting, overlapping, or running.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the correct procedures for vertical-down welding (E10.13.1-E10.13.10).
2. Have students work in groups of two, practice vertical-down welding, and evaluate the welding procedures and products of each other(E10.13.1-E10.13.10).
3. Evaluate qualities of the vertical-down weld (E10.13.9).

SELECTED TOOLS AND MATERIALS

Welding equipment
Protective clothing
3/16" mild steel plate
1/8" electrodes
Clamps

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/Cassette: Arc Welding in the Vertical Position. Bergwall Productions, Inc.
Transparency: Arc Welding Positions, W-23. Hobar.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Modern Agricultural Mechanics, Chapter 7. Wakeman.
Shielded Metal Arc Welding, Topic 24. Hobart School of Welding Technology.

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DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

10.14 Perform horizontal welding

COURSE

Agricultural Science and Mechanics II (8008)

10.14

PERFORMANCE OBJECTIVE

P10.14 Given welding equipment and supplies, perform horizontal welding. Weld bead must be smooth, regular, and uniform without undercutting, overlapping, or running.

SELECTED ENABLING OBJECTIVES

E10.14.1 Identify safety practices to follow.

E10.14.2 Assemble equipment and supplies.

E10.14.3 Select amperage.

E10.14.4 Strike and establish an arc.

E10.14.5 Angle electrode.

E10.14.6 Maintain correct arc length and speed.

E10.14.7 Weld a bead.

E10.14.8 Remove a slag.

E10.14.9 Evaluate weld bead.

E10.14.10 Demonstrate safe use of arc welding equipment (P10.3).

CRITERION-REFERENCED MEASURE

C10.14 Horizontal welding performed, welding smooth, regular, and uniform without undercutting, overlapping, or running.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the correct procedures for welding (E10.14.1-E10.14.10).
2. Have students work in groups of two, practice horizontal welding, and evaluate the welding procedures and products of each other (E10.14.1-E10.14.10).
3. Evaluate qualities of the horizontal weld (E10.14.9).

SELECTED TOOLS AND MATERIALS

Welding equipment
Protective clothing
3/16" mild steel plate
1/8" electrodes
Clamps

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/Cassette: Arc Welding in the Horizontal Position. Bergwall Productions, Inc.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Modern Agricultural Mechanics, Chapter 7. Wakeman.
Shielded Metal Arc Welding, Topic 24. Hobart School of Welding Technology.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.15 Perform vertical-up welding

----------------Application---------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

10.15

PERFORMANCE OBJECTIVE

P10.15 Given welding equipment and supplies, perform vertical-up welding. Weld bead must be smooth, regular, and uniform without undercutting, overlapping, or running.

SELECTED ENABLING OBJECTIVES

E10.15.1 Identify safety practices to follow.

E10.15.2 Assemble equipment and supplies.

E10.15.3 Select amperage.

E10.15.4 Strike and establish an arc.

E10.15.5 Angle electrode.

E10.15.6 Maintain correct arc length and speed.

E10.15.7 Weld a bead.

E10.15.8 Remove a slag.

E10.15.9 Evaluate weld bead.

E10.15.10 Demonstrate safe use of arc welding equipment (P10.3).

CRITERION-REFERENCED MEASURE

C10.15 Vertical-up welding performed, welding smooth, regular, and uniform without undercutting, overlapping, or running.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the correct procedures for welding (E10.15.1-E10.15.10).
2. Have students work in groups of two, practice vertical-up welding, and evaluate the welding procedures and products of each other (E10.15.1-E10.15.10).
3. Evaluate qualities of the vertical-up weld (E10.15.9).

SELECTED TOOLS AND MATERIALS

Welding equipment
Protective clothing
3/16" mild steel plate
1/8" electrodes
Clamps

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/cassette: Arc Welding in the Horizontal Position. Bergwall Productions, Inc.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Modern Agricultural Mechanics, Chapter 7. Wakeman.
Shielded Metal Arc Welding, Topic 24. Hobart School of Welding Technology.

---------------Application--------------

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

10.16 Perform overhead welding

COURSE

Agricultural Science and Mechanics II (8008)

10.16

PERFORMANCE OBJECTIVE

P10.16 Given welding equipment and supplies, perform overhead welding. Weld bead must be smooth, regular, and uniform without undercutting, overlapping, or running.

SELECTED ENABLING OBJECTIVES

E10.16.1 Identify safety practices to follow.

E10.16.2 Assemble equipment and supplies.

E10.16.3 Select amperage.

E10.16.4 Strike and establish an arc.

E10.16.5 Angle electrode.

E10.16.6 Maintain correct arc length and speed.

E10.16.7 Weld a bead.

E10.16.8 Remove slag.

E10.16.9 Evaluate weld bead.

E10.16.10 Demonstrate safe use of arc welding equipment (P10.3).

CRITERION-REFERENCED MEASURE

C10.16 Overhead welding performed, welding smooth, regular, and uniform without undercutting, overlapping, or running.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the correct procedures for overhead welding (E10.16.1-E10.16.10).
2. Have students work in groups of two, practice overhead welding, and evaluate the welding procedures and products of each other (E10.16.1-E10.16.10).
3. Evaluate qualities of the overhead weld (E10.16.9).

SELECTED TOOLS AND MATERIALS

Welding equipment
Protective clothing
3/16" mild steel plate
1/8" electrodes
Clamps

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/Cassette: Arc Welding in the Overhead Position. Bergwall Productions, Inc.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Modern Agricultural Mechanics, Chapter 7. Wakeman.
Shielded Metal Arc Welding, Topics 18-20, 30. Hobart School of Welding Technology.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.17 Hardsurface metal with an arc welder

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

10.17

PERFORMANCE OBJECTIVE

P10.17 Given welding equipment and supplies, hardsurface metal with an arc welder. The hardsurfacing material must be smoothly and evenly applied without excess penetration and burn-through along the edge of the work piece.

SELECTED ENABLING OBJECTIVES

E10.17.1 Determine which metals can be surfaced.

E10.17.2 Determine service requirements of the metal to be surfaced.

E10.17.3 Identify types of surfacing electrodes.

E10.17.4 Determine the type of electrode needed.

E10.17.5 Identify safety practices to follow.

E10.17.6 Preheat the metal.

E10.17.7 Adjust amperage, voltage, and polarity.

E10.17.8 Apply hardsurfacing materials in two layers.

E10.17.9 Remove slag.

E10.17.10 Evaluate.

E10.17.11 Apply additional layers, if necessary.

E10.17.12 Demonstrate safe use of arc welding equipment (P10.3).

CRITERION-REFERENCED MEASURE

C10.17 Metal hardsurfaced smoothly and evenly without excess penetration and burn-through.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate hardsurfacing (E10.17.1-E10.17.12).
2. Have students identify types of hardsurfacing electrodes (E10.7.3).
3. Have students select types of electrodes to use on different types of metal for different service requirements (E10.17.1-E10.17.4).
4. Have students practice on samples of material similar to those used in their SOEPs (E10.7.5-E10.7.12).

SELECTED TOOLS AND MATERIALS

Arc welding equipment
Hardsurfacing electrodes
Examples of hardsurfacing
Clamps

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Modern Agricultural Mechanics, Chapter 7. Wakeman.

DUTY AREA

10. PERFORMING ARC WELDING OPERATIONS

TASK/COMPETENCY

10.18 Cut metal with an arc welder

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

10.18

PERFORMANCE OBJECTIVE

P10.18 Given welding equipment and supplies, cut (groove, bevel, pierce, gouge, and scarf) metal with an arc welder. The cut must conform to the specifications given by the instructor.

SELECTED ENABLING OBJECTIVES

E10.18.1 Identify safety practices to follow.

E10.18.2 Assemble equipment and supplies.

E10.18.3 Position metal to be cut.

E10.18.4 Mark the area to be cut.

E10.18.5 Select electrode.

E10.18.6 Select amperage.

E10.18.7 Preheat metal, if necessary.

E10.18.8 Force the electrode in the direction of the cut.

E10.18.9 Evaluate the cut.

E10.18.10 Demonstrate safe use of arc welding equipment.

CRITERION-REFERENCED MEASURE

C10.18 Metal cut with arc welder to conform to instructor's specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate cutting to include grooving, beveling, piercing, gouging, and scarfing (E10.18.1-E10.18.10).
2. Have students identify and select electrodes used for cutting metal (E10.18.5).
3. Have students practice on samples of metal similar to those used in their SOEPs (E10.18.1-E10.18.10).

SELECTED TOOLS AND MATERIALS

Arc welding equipment
Examples of metal cut with an arc welder
Soapstone
Clamps

SELECTED AUDIOVISUAL MATERIALS

Transparency: Cutting a Plate with an Electrode. Latta.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 13. Phipps.
Modern Agricultural Mechanics, Chapter 7. Wakeman.

DUTY AREA

11. PERFORMING SOLDERING OPERATIONS

TASKS/COMPETENCIES

11.1 Interpret soldering plans

11.2 Identify and select soldering tools, equipment, and supplies

11.3 Measure, cut, and prepare metal for soldering

11.4 Demonstrate propane torch operation

11.5 Tin a soldering copper

11.6 Demonstrate proper use of soldering copper

11.7 Demonstrate proper use of soldering gun

11.8 Construct an approved soldering project

DUTY AREA

11. PERFORMING SOLDERING OPERATIONS

TASK/COMPETENCY

11.1 Interpret soldering plans

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

11.1

PERFORMANCE OBJECTIVE

P11.1 Given soldering plans, interpret soldering plans by identifying with 90% accuracy the views, dimensions, lines, abbreviations, and symbols used on the plans and by identifying materials needed with 100% accuracy.

SELECTED ENABLING OBJECTIVES

E11.1.1 Identify views, dimensions, abbreviations, and symbols on soldering plans.

E11.1.2 Identify materials needed to complete the project.

E11.1.3 Make a rough sketch of soldering project.

CRITERION-REFERENCED MEASURE

C11.1 Soldering plans interpreted by identifying with 90% accuracy the views, dimensions, lines, abbreviations, and symbols used on the plans, materials needed identified with 100% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies needed in agricultural mechanics (E11.1.1-E11.1.3).
2. Define concepts related to working drawings (E11.1.1).
3. Have students prepare a bill of materials from the plans (E11.1.2).
4. Have students prepare rough sketches of soldering projects (E11.1.3).

SELECTED TOOLS AND MATERIALS

Soldering plans (feed scoop, dust pan, funnel)

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 18. Phipps.
Modern Agricultural Mechanics, Chapter 9. Wakeman.

DUTY AREA

11. PERFORMING SOLDERING OPERATIONS

TASK/COMPETENCY

11.2 Identify and select soldering

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

11.2

PERFORMANCE OBJECTIVE

P11.2 Given a selection of soldering tools, equipment, and supplies, identify and select with 90% accuracy the tools, equipment, and supplies needed for soldering.

SELECTED ENABLING OBJECTIVES

E11.2.1 Select tools, equipment, and supplies used in soldering.

E11.2.2 Describe the uses and functions of soldering tools, equipment, and supplies.

E11.2.3 Name the parts of each tool and piece of equipment used in soldering.

E11.2.4 Select the types of solder for different types of metals.

E11.2.5 Identify metals (Duty Area 6).

CRITERION-REFERENCED MEASURE

C11.2 Soldering tools, equipment, and supplies identified and selected with 90% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate the uses of soldering tools, equipment, and supplies (E11.2.1-E11.2.5).
2. Have students use references (e.g., Wakeman, pp. 238-239) to select the types of solder to use for different types of metals (E11.2.4).
3. Test students' ability to identify tools, equipment, and supplies after using (E11.2.1-E11.2.4).
4. Have students prepare a list of soldering tools and equipment available at home (E11.2.1-E11.2.4).

SELECTED TOOLS AND MATERIALS

Different types of solder
Samples of metal
Soldering paste
Carbon-arc torch
Electric soldering iron
Soldering gun
Friction lighter
Propane tank and tip
Steel wool
Pliers
Wire brush
Grinder
Cooling water
Clean cloth
Vise
Blow torch
Sal ammoniac block
Fluxes

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 18. Phipps.
Modern Agricultural Mechanics, Chapter 9. Wakeman.
Solder. Barber.

DUTY AREA

11. PERFORMING SOLDERING OPERATIONS

TASK/COMPETENCY

11.3 Measure, cut, and prepare metal for soldering

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

11.3

PERFORMANCE OBJECTIVE

P11.3 Given metal for soldering, measure, cut, and prepare metal for soldering. Metal must be measured and cut to specifications and be free of impurities.

SELECTED ENABLING OBJECTIVES

E11.3.1 Identify safety practices to follow.

E11.3.2 Measure metal for cutting.

E11.3.3 Cut metal for soldering.

E11.3.4 Clean metal.

E11.3.5 Select flux.

E11.3.6 Describe the functions of flux.

E11.3.7 Apply flux.

E11.3.8 Evaluate the cut.

CRITERION-REFERENCED MEASURE

C11.3 Metal measured, cut, and cleaned according to specifications and free of impurities.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review Duty Area 9 for measuring and cutting metal (E11.3.1-E11.3.3).
2. Clean metal by filing, grinding, sanding, or using muriatic acid. Rinse with water (E11.3.4).
3. Have students select, describe the function of flux, and apply flux (E11.3.5-E11.3.8).

SELECTED TOOLS AND MATERIALS

Measuring devices
Cutting devices
Files
Grinders
Sand paper
Muriatic acid
Fluxes (different types)
Flux brush
Different types of metal

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 18. Phipps.
Modern Agricultural Mechanics, Chapter 9. Wakeman.
Solder. Barber.

DUTY AREA

11. PERFORMING SOLDERING OPERATIONS

TASK/COMPETENCY

11.4 Demonstrate propane torch operation

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

11.4

PERFORMANCE OBJECTIVE

P11.4 Given instructor's specifications for the type of flame, a propane torch, necessary equipment, and safety precautions, demonstrate propane torch operating by maintaining the specified type of flame and following safety precautions.

SELECTED ENABLING OBJECTIVES

E11.4.1 Describe the properties of propane gas.

E11.4.2 List the advantages and disadvantages of heating with a propane torch.

E11.4.3 Identify safety practices to follow.

E11.4.4 Attach the heating torch to the propane cylinder.

E11.4.5 Light the torch.

E11.4.6 Adjust the flame.

E11.4.7 Apply heat with the torch.

E11.4.8 Shut off the torch.

CRITERION-REFERENCED MEASURE

C11.4 Propane torch operation demonstrated by maintaining the specified type of flame and following safety precautions.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate and describe the properties of propane (E11.4.1, E11.4.2).
2. Demonstrate the proper use of the propane torch (E11.4.1-E11.4.8).
3. Have students pass a safety test on the use of a propane torch (E11.4.3).
4. Have students practice lighting the torch and applying heat to an object using different types of flame (E11.4.5-E11.4.8).

SELECTED TOOLS AND MATERIALS

Propane torch
Flint lighter
Propane cylinder
Safety test on propane torch

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 18. Phipps.
Modern Agricultural Mechanics, Chapter 9. Wakeman.

DUTY AREA

11. PERFORMING SOLDERING OPERATIONS

TASK/COMPETENCY

11.5 Tin a soldering copper

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

11.5

PERFORMANCE OBJECTIVE

P11.5 Given a soldering copper with the necessary equipment and supplies, tin a soldering copper. The copper must be free of pits, clean, pointed, and covered with a thin coat of solder.

SELECTED ENABLING OBJECTIVES

E11.5.1 Define terms associated with soldering.

E11.5.2 Identify safety practices to follow.

E11.5.3 Heat the soldering copper to a cherry red.

E11.5.4 File each face until smooth.

E11.5.5 Hammer the face to remove pits, if necessary.

E11.5.6 Apply sal ammoniac or resin flux.

E11.5.7 Apply thin coat of solder to heated copper.

E11.5.8 Wipe excess solder from copper with damp cloth.

E11.5.9 Evaluate tinning of a soldering copper.

CRITERION-REFERENCED MEASURE

C11.5 Soldering copper tinned so that it is free of pits, clean, pointed, and covered with a thin coat of solder.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Define and illustrate terms used with soldering while demonstrating the tinning of a soldering copper (E11.5.1-E11.5.9).
2. Have students pass a safety test on soldering (E11.5.2).
3. Have students bring in soldering copper to tin (E11.5.1-E11.5.9).
4. Have students practice tinning a soldering copper (E11.5.1-E11.5.9).

SELECTED TOOLS AND MATERIALS

Safety test on soldering
Sal ammoniac
Resin flux
File, fine
Hammer
Clean cloth
Solder
Flux brush

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 18. Phipps.
Modern Agricultural Mechanics, Chapter 9. Wakeman.

----------------Application--------------

DUTY AREA

11. PERFORMING SOLDERING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

11.6 Demonstrate proper use of soldering copper

COURSE

Agricultural Science and Mechanics I (8006)

11.6

PERFORMANCE OBJECTIVE

P11.6 Given a soldering copper and the necessary equipment and supplies, demonstrate the proper use of a soldering copper. The soldered area must be smooth, clean, and watertight.

SELECTED ENABLING OBJECTIVES

E11.6.1 Describe the principles involved in soldering.

E11.6.2 Identify safety practices to follow.

E11.6.3 Tin a soldering copper (P11.5).

E11.6.4 Retin a soldering copper, if necessary.

E11.6.5 Clean metal to be soldered.

E11.6.6 Select type of solder.

E11.6.7 Select flux and apply.

E11.6.8 Apply heat with soldering copper.

E11.6.9 Apply solder to the area.

E11.6.10 Clean soldered area.

E11.6.11 Evaluate.

CRITERION-REFERENCED MEASURE

C11.6 Proper use of soldering copper demonstrated by leaving the soldered area smooth, clean, and watertight.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Describe the principles involved in soldering while demonstrating the use of a soldering copper (E11.6.1-E11.6.11).
2. Have students pass a safety test on soldering (E11.6.2).
3. Have students practice fitting holes, patching holes, and soldering seams (E11.6.1-E11.6.11).
4. Have students bring in items to solder (E11.6.1-E11.6.11).
5. Have students solder various metals--tin, galvanized iron, copper, and cast iron (E11.6.1-E11.6.11).

SELECTED TOOLS AND MATERIALS

Safety test on soldering
Soldering copper
Sal ammoniac
Resin flux
File, fine
Hammer
Clean cloth
Solders
Fluxes
Flux brushes

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 18. Phipps.
Modern Agricultural Mechanics, Chapter 9. Wakeman.
Solder. Barber.

DUTY AREA

11. PERFORMING SOLDERING OPERATIONS

TASK/COMPETENCY

11.7 Demonstrate proper use of soldering gun

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

11.7

PERFORMANCE OBJECTIVE

P11.7 Given a soldering gun with the necessary equipment and supplies, demonstrate the proper use of a soldering gun. The soldered joint must be tight, smooth, and clean. The soldering tip should show no signs of overheating.

SELECTED ENABLING OBJECTIVES

E11.7.1 Describe the principles involved in soldering.

E11.7.2 List the advantages and disadvantages of using a soldering gun.

E11.7.3 Identify safety practices to follow.

E11.7.4 Tin the tip of the soldering gun.

E11.7.5 Clean area to be soldered.

E11.7.6 Select type of solder.

E11.7.7 Select flux and apply.

E11.7.8 Apply heat with soldering tip.

E11.7.9 Apply solder to the area.

E11.7.10 Clean soldered area.

E11.7.11 Evaluate.

CRITERION-REFERENCED MEASURE

C11.7 Proper use of soldering gun demonstrated by leaving a tight, smooth, and clean soldered joint and by not damaging the tip of the soldering gun.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Describe the principles involved in soldering while demonstrating the use of the soldering gun (E11.7.1-E11.7.11).
2. Have students pass a safety test on soldering (E11.7.1-E11.7.11).
3. Have students practice joining different types of wires with the soldering gun (E11.7.3-E11.7.11).

SELECTED TOOLS AND MATERIALS

Safety test on soldering
Soldering gun
Solders
Fluxes
Flux brushes
Electrical wires
Clean cloth

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 18. Phipps.
Operator's Guide (manufacturer's).
Solder. Barber.

DUTY AREA

11. PERFORMING SOLDERING OPERATIONS

TASK/COMPETENCY

11.8 Construct an approved soldering project

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

11.8

PERFORMANCE OBJECTIVE

P11.8 Given an assignment to construct an approved soldering project and access to the necessary tools, equipment, and supplies, construct an approved soldering project. Project plans must be approved by the instructor, and project must conform to the plans and specifications.

SELECTED ENABLING OBJECTIVES

E11.8.1 Select or draw a plan.

E11.8.2 Interpret soldering plans (Task 11.1).

E11.8.3 Select the needed tools, equipment, supplies, and materials.

E11.8.4 Estimate the time and cost to complete the project.

E11.8.5 Describe the types of skills needed.

E11.8.6 Identify safety practices to follow.

E11.8.7 Verify the quality of soldering.

E11.8.8 Demonstrate safe use of soldering equipment.

CRITERION-REFERENCED MEASURE

C11.8 Instructor-approved soldering project constructed, conforming to the plans and specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies for agricultural mechanics (E11.8.1, E11.8.2).
2. Have students list tools, equipment, supplies, and materials needed (E11.8.3).
3. Have students describe procedures to use (E11.8.4, E11.8.5).
4. Verify that students have passed a safety test and are able to perform the required competencies (E11.8.6-E11.8.9).
5. Plan soldering projects to coincide with supervised occupational experience programs (E11.8.1-E11.8.8).
6. Observe and provide assistance when needed (E11.8.1-E11.8.8).

SELECTED TOOLS AND MATERIALS

Soldering plans
Soldering equipment
Protective clothing
Metal and materials as required by plans

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Agricultural Mechanics Plans. Hobar.
Mechanics in Agriculture, Chapter 18. Phipps.
Modern Agricultural Mechanics, Chapter 9. Wakeman.
Solder. Barber.
Vocational Agriculture Student Farm Shop Manual, Chapter 7. Pynnonen.

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

TASKS/COMPETENCIES

12.1 Interpret woodworking plans

12.2 Identify hand woodworking tools and supplies

12.3 Measure and mark wood

12.4 Select and use hand woodworking tools

12.5 Glue wood materials

12.6 Select and use wood fasteners

12.7 Calculate board feet

12.8 Figure bill of materials

12.9 Identify types of plywood

12.10 Construct an agricultural woodworking project using hand tools

12.11 Select and use agricultural power woodworking tools (portable and stationary)

12.12 Adjust and maintain power woodworking tools (portable and stationary)

12.13 Identify types of wood

12.14 Construct an agricultural woodworking project using power tools

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

TASK/COMPETENCY

12.1 Interpret woodworking plans

---------------Application---------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

12.1

PERFORMANCE OBJECTIVE

P12.1 Given woodworking plans, interpret woodworking plans by identifying with 90% accuracy the views, dimensions, lines, abbreviations and symbols used on the plans and by identifying materials needed with 100% accuracy.

SELECTED ENABLING OBJECTIVES

E12.1.1 Identify views, dimensions, abbreviations, and symbols on the woodworking plans.

E12.1.2 Identify materials needed to complete the project.

E12.1.3 Make a rough sketch of a woodworking project.

CRITERION-REFERENCED MEASURE

C12.1 Woodworking plans interpreted by identifying with 90% accuracy the views, dimensions, lines, abbreviations, and symbols used on the plans, materials identified with 100% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies needed in agricultural mechanics--Duty Area 5 (E12.1.1, E12.1.3).
2. Define key concepts related to working drawings (E12.1.1).
3. Have students prepare a bill of materials from woodworking plans (E12.1.2).
4. Have students prepare sketches of woodworking plans (E12.1.3).

SELECTED TOOLS AND MATERIALS

Woodworking plans
Drafting equipment and supplies

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Blueprint Reading Basics (58 transparencies). Hobar.

SELECTED REFERENCES

Agricultural Mechanics Plans for Shop Projects. Instructional Materials Laboratory.
Mechanics in Agriculture, Chapter 7. Phipps.
Modern Agricultural Mechanics, pp. 21-23. Wakeman.
Technical Woodworking, Unit 6. Groneman and Glazener.
Working in Agricultural Mechanics, Chapter 5. Shinn and Weston.

----------------Application--------------

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

12.2 Identify hand woodworking tools and supplies

COURSE

Agricultural Science and Mechanics I (8006)

12.2

PERFORMANCE OBJECTIVE

P12.2 Given a selection of hand woodworking tools and supplies, correctly identify hand woodworking tools and supplies with 95% accuracy on a written or oral test.

SELECTED ENABLING OBJECTIVES

E12.2.1 Select tools and supplies used in hand woodworking.

E12.2.2 Describe the uses and functions of hand woodworking tools and supplies.

E12.2.3 Name the parts of each hand woodworking tool.

CRITERION-REFERENCED MEASURE

C12.2 Hand woodworking tools and supplies identified with 95% accuracy on a written or oral test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate the uses of hand woodworking tools and supplies (E12.2.1-E12.2.3).
2. Have students use references to identify the names of woodworking tools and supplies (E12.2.1-E12.2.3).
3. Test students' ability to identify tools and supplies after using (E12.2.1-E12.2.3).
4. Have students prepare a list of woodworking tools and supplies available at home or in their SOEPs (E12.2.1-E12.2.3).

SELECTED TOOLS AND MATERIALS

Hand woodworking tools and supplies

SELECTED AUDIOVISUAL MATERIALS

Film: Hand Tools for Woodworking (#58208). Virginia Department of Education.

Transparencies: Woodworking Hand Tools (20 transparencies). Hobar
Group I--Safety in the Wood Shop. (5 transparencies) Hobar.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 4. Phipps.
Modern Agricultural Mechanics, Chapter 11. Wakeman.
Stanley Tool Guide. Stanley.
Technical Woodworking, Section 3. Groneman and Glazener.

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

TASK/COMPETENCY

12.3 Measure and mark wood

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and
Mechanics I (8006)

12.3

PERFORMANCE OBJECTIVE

P12.3 Given different sizes of wood stock, measuring and marking devices, measure and mark wood within a tolerance of ±1/32 inch.

SELECTED ENABLING OBJECTIVES

E12.3.1 Identify and select devices used to measure and mark wood.

E12.3.2 Identify safety practices to follow.

E12.3.3 Describe the procedures for using each measuring and marking device.

E12.3.4 Use measuring and marking devices.

E12.3.5 Verify the correctness of the layout.

CRITERION-REFERENCED MEASURE

C12.3 Wood measured and marked within a tolerance of ±1/32 inch.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display measuring and marking devices (E12.3.1).
2. Demonstrate and explain the use of each device (E12.3.1-E12.3.5).
3. Discuss factors to consider when laying out work (E12.3.4).
4. Have students measure and layout wood products (E12.3.4, E12.3.5).

SELECTED TOOLS AND MATERIALS

Bench rule
Extension rule
Tape measure
Squares
Marking pencil
Scratch awl
Chalk line reel
Plumb bob
Dividers
Calipers
Templates
Sliding T-bevel
Wood samples
Scriber

SELECTED AUDIOVISUAL MATERIALS

Film: What is Measurement? (#15506). Virginia Department of Education.
Filmstrip/cassette: Measuring Tools and Marking Tools. Bergwall Productions, Inc.
Filmstrip: Measuring, Testing, and Marking. Stanley.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 4. Phipps.
Technical Woodworking, Section 3. Groneman and Glazener.
Working in Agricultural Mechanics, Chapter 8. Shinn and Weston.

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

TASK/COMPETENCY

12.4 Select and use hand woodworking tools

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

12.4

PERFORMANCE OBJECTIVE

P12.4 Given hand woodworking tools and the needed lumber and directions, select and use hand woodworking tools. The correct tool must be selected for a given situation, used carefully and correctly, according to instructor's guidelines.

SELECTED ENABLING OBJECTIVES

E12.4.1 Define key terms and concepts related to groups (example: sawing, scraping, etc.) of hand woodworking tools.

E12.4.2 Identify safety rules which apply to the use of each tool.

E12.4.3 Examine and select the appropriate size and type of tool for a particular activity.

E12.4.4 Use tools correctly and safely.

E12.4.5 Demonstrate care and maintenance of tools.

CRITERION-REFERENCED MEASURE

C12.4 Correct hand woodworking tool for given job selected and used carefully and correctly, according to instructor's guidelines.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate the selection and use of hand woodworking tools (E12.4.1-E12.4.5).

2. Discuss key terms and concepts related to groups of hand woodworking tools (E12.4.1).

3. Have students pass a safety test on hand woodworking tools (E12.4.2-E12.4.4).

4. Observe and assist while students perform practical exercises in developing competencies (E12.4.1-E12.4.5).

5. Have students construct approved projects with hand woodworking tools (E12.4.1-E12.4.5).

SELECTED TOOLS AND MATERIALS

Hand woodworking tools
Safety tests

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/cassette: Woodworking Hand Tools Explained. Bergwall Productions, Inc.
Transparencies: Woodworking Hand Tools. Hobar.
Filmstrips: Bench Planes. Stanley
Chisels for Woodworking. Stanley
Hammers, Screwdrivers, Nails and Screws. Stanley.
Handsaws. Stanley.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 4. Phipps.
Modern Agricultural Mechanics, Chapter 11. Wakeman.
Technical Woodworking, Section 3. Groneman and Glazener.
Working in Agricultural Mechanics, Chapter 8. Shinn and Weston.

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

TASK/COMPETENCY

12.5 Glue wood materials

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

12.5

PERFORMANCE OBJECTIVE

P12.5 Given material to be glued and a selection of glues, glue wood materials. The correct glue must be selected, and the material must be as strong or stronger than the wood itself and show no signs of excess glue or clamp marks.

SELECTED ENABLING OBJECTIVES

E12.5.1	Identify adhesive types.
E12.5.2	Describe the characteristics and uses of adhesive types.
E12.5.3	Identify safety practices to follow.
E12.5.4	Select glue.
E12.5.5	Prepare surface for gluing.
E12.5.6	Arrange parts to be glued.
E12.5.7	Select clamps.
E12.5.8	Mix or prepare glue.
E12.5.9	Apply glue.
E12.5.10	Clamp parts together.
E12.5.11	Remove excess glue.

CRITERION-REFERENCED MEASURE

C12.5 Wood material glued using the correct glue, leaving the material as strong or stronger than the wood itself and showing no signs of excess glue or clamp marks.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display different types of adhesives and materials to be glued and have students select the correct adhesive (E12.5.1-E12.5.4).
2. Have students glue scrap materials or use woodworking projects that require gluing (E12.5.5-E12.5.11).
3. Test the strength of glued scrap wood (E12.5.2).

SELECTED TOOLS AND MATERIALS

Assorted adhesives
Scrap lumber
Wood clamps
C-clamps

SELECTED AUDIOVISUAL MATERIALS

Film: Glue and Clamping (#10210). Virginia Department of Education.

Transparencies: Group IV--Adhesives and Gluing (2 transparencies) Hobar.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 9. Phipps.
Modern Agricultural Mechanics, Chapter 11. Wakeman.
Technical Woodworking, Unit 116. Groneman and Glazener.
Working in Agricultural Mechanics, Chapter 7. Shinn and Weston.

----------------Application--------------

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

12.5 Select and use wood fasteners

COURSE

Agricultural Science and Mechanics I (8006)

12.6

PERFORMANCE OBJECTIVE

P12.6 Given a selection of wood fasteners, wood to be fastened, and the necessary tools to install the fasteners, select and use wood fasteners. The correct fastener must be selected and installed according to the directions of the instructor.

SELECTED ENABLING OBJECTIVES

E12.6.1 Identify wood fasteners by name.

E12.6.2 Explain the characteristics and uses of each fastener.

E12.6.3 Identify safety practices to follow.

E12.6.4 Select the correct type and size of fastener.

E12.6.5 Arrange material to be fastened.

E12.6.6 Select the tool needed to install fastener.

E12.6.7 Install fastener.

CRITERION-REFERENCED MEASURE

C12.6 The correct fastener selected and installed according to the directions of the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate the use of wood fasteners (E12.6.1-E12.6.7).
2. Have students select and use several types of wood fasteners (E12.6.3-E12.6.7).
3. Have students report on fasteners used in their SOEPs (E12.6.1-E12.6.7).

SELECTED TOOLS AND MATERIALS

Nails
Screws
Hinges
Bolts
Staples
Anchors
Door pull
Elbow catch
Door button
Screw hook
Corner brace
Screw eye
Hook and eye
Corrugated fastener
Brads
Display panels of various fasteners
Hammers
Screwdrivers
Countersinks

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Group VII--Fasteners. Hobar.
Building and Machining Fasteners. Hobar.

SELECTED REFERENCES

Fastening with Wood Screws (LAP). Virginia Department of Education.
Mechanics in Agriculture, Chapter 9. Phipps.
Modern Agricultural Mechanics, Chapter 10. Wakeman.
Technical Woodworking, Units 112 and 113. Groneman and Glazener.

----------------Application--------------

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

12.7 Calculate board feet

COURSE

Agricultural Science and Mechanics I (8006)

12.7

PERFORMANCE OBJECTIVE

P12.7 Given a piece of lumber, calculate board feet with 100% accuracy, according to instructor's guidelines.

SELECTED ENABLING OBJECTIVES

E12.7.1 Define terms associated with calculating board feet.

E12.7.2 Measure lumber.

E12.7.3 Use board foot formulas for calculations.

E12.7.4 Use Essex table.

CRITERION-REFERENCED MEASURE

C12.7 Board feet calculated with 100% accuracy, according to instructor's guidelines.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Using samples of lumber, define and discuss key terms associated with calculating board feet (E12.7.1).
2. Demonstrate measurement of lumber and substituting values in the board foot formulas (E12.7.2-E12.7.5).
3. Have students compute board feet from a bill of materials (E12.7.3).
4. Demonstrate use of the Essex table for standard lengths of lumber (E12.7.4).
5. Have students calculate board feet in actual projects (E12.7.2, E12.7.3).

SELECTED TOOLS AND MATERIALS

Framing square
Measuring tool
Various sizes of lumber

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 6. Phipps.
Modern Agricultural Mechanics, Chapter 10. Wakeman.
Technical Woodworking, Unit 8. Groneman and Glazener.

----------------Application--------------

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

12.8 Figure bill of materials

COURSE

Agricultural Science and
Mechanics I (8006)

12.8

PERFORMANCE OBJECTIVE

P12.8 Given a working drawing for a woodworking project, figure bill of materials. The list must include the names, sizes, quantities, and cost of materials.

SELECTED ENABLING OBJECTIVES

E12.8.1 List the standard sizes of materials.

E12.8.2 Identify materials needed by name and size.

E12.8.3 Compute the quantity of materials needed.

E12.8.4 Compute the cost of materials.

E12.8.5 Fill out the bill of materials.

CRITERION-REFERENCED MEASURE

C12.8 Bill of materials figured, including the names, quantities, sizes, and cost.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display and discuss the standard sizes of materials (E12.8.1).
2. Display bills of materials and demonstrate how to compute the quantity and cost of materials (E12.8.2-E12.8.5).
3. Have students figure bill of materials for woodworking projects (E12.8.1-E12.8.5).

SELECTED TOOLS AND MATERIALS

Working drawings
Bill of materials (examples)
Cost information

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Building Materials. Hobar.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 6. Phipps.
Modern Agricultural Mechanics, Chapter 1. Wakeman.

---------------Application--------------

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

12.9 Identify types of plywood

COURSE

Agricultural Science and Mechanics I (8006)

12.9

PERFORMANCE OBJECTIVE

P12.9 Given an assortment of plywood that has the typical back stamp, identify types of plywood. The identification must include the correct grade and classification.

SELECTED ENABLING OBJECTIVES

E12.9.1 Define terms associated with plywood.

E12.9.2 Explain how plywood is graded and classified.

E12.9.3 Identify the uses of plywood.

CRITERION-REFERENCED MEASURE

C12.9 Types of plywood identified by grade and classification.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display and discuss the grading and classification of plywood (E12.9.1, E12.9.2).
2. Visit a lumber yard to observe the different grades and classifications of plywood (E12.9.1, E12.9.2).
3. Have students identify agricultural uses of plywood (E12.9.3).

SELECTED TOOLS AND MATERIALS

Samples of plywood

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Veneer, WT-13. Hobar.
The Manufacture of Plywood, WT-15. Hobar.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 30. Phipps.
Plywood Encyclopedia. American Plywood Association.
Plywood Grades and Specifications. American Plywood Association.
Technical Woodworking, Unit 148. Groneman and Glazener.
Unwinding a Tree: The Story of Plywood. American Plywood Association.

----------------Application--------------

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

12.10 Construct an agricultural woodworking project using hand tools

COURSE

Agricultural Science and Mechanics I (8006)

12.10

PERFORMANCE OBJECTIVE

P12.10 Given an assignment to construct an agricultural woodworking project and access to the needed hand tools and supplies, construct an agricultural woodworking project using hand tools. Project plans must be approved by the instructor, and completed project must conform to the plans and specifications.

SELECTED ENABLING OBJECTIVES

E12.10.1 Select or draw a plan.

E12.10.2 Interpret woodworking plans (Task 12.1).

E12.10.3 Select the necessary hand tools and supplies.

E12.10.4 Estimate the time and cost to complete the project.

E12.10.5 Describe the types of skills needed.

E12.10.6 Identify safety practices to follow.

E12.10.7 Evaluate the quality of work done.

E12.10.8 Demonstrate safe use of hand woodworking tools.

CRITERION-REFERENCED MEASURE

C12.10 An instructor-approved agricultural woodworking project constructed with hand tools, completed project conforming to plans and specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies for agricultural mechanics (E12.10.1, E12.10.2).
2. Have students list the needed hand tools, supplies, and materials needed (E12.10.3).
3. Have students describe procedures to use (E12.10.4, E12.4.5).
4. Verify that students have passed a safety test and are able to perform the required competencies (E12.10.6-E12.10.8).
5. Plan hand woodworking projects that will include competencies 12.1 to 12.9 (E12.10.1-E12.10.8).
6. Observe and provide assistance when needed (E12.10.1-E12.10.8).

SELECTED TOOLS AND MATERIALS

Woodworking plans
Hand woodworking tools
Lumber as required by plans

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Agricultural Mechanics Plans. Hobar.
Agricultural Mechanics Plans for Shop Projects. Instructional Materials Laboratory.
Vocational Agriculture Student Farm Shop Manual, Chapter 15. Pynnonen.
Working in Agricultural Mechanics: Activity Guide and Project Plan Book. Shinn and Weston.

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

TASK/COMPETENCY

12.11 Select and use agricultural power woodworking tools (portable and stationary)

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

12.11

PERFORMANCE OBJECTIVE

P12.11 Given measured and marked wood, select and use agricultural power woodworking tools. The correct tool must be selected and used without safety infractions or damage to the power tool. The completed operation must be within 1/32" of specifications. Sawdust and debris must be removed.

SELECTED ENABLING OBJECTIVES

E12.11.1 Identify safety practices to follow.

E12.11.2 Identify parts of the power tool.

E12.11.3 Identify types of cutting mechanisms.

E12.11.4 Select proper cutting mechanisms.

E12.11.5 Remove and replace cutting mechanism.

E12.11.6 Identify types of wood (P12.13).

E12.11.7 Assemble materials.

E12.11.8 Describe procedures for using power tool.

E12.11.9 Perform required operation.

E12.11.10 Adjust equipment as needed.

E12.11.11 Inspect cutting operation.

E12.11.12 Clean power tool and work area (P4.2).

CRITERION-REFERENCED MEASURE

C12.11 The correct agricultural power woodworking tool selected and used without safety infraction or tool damage, wood cut within 1/32" of specifications, and working area cleaned.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Without energizing power tools, have students familiarize themselves with each power tool by answering questions on the basic operation, adjustment, and function of parts, safety procedures to follow, etc. (E12.11.1-E12.11.8).
2. Have students study and answer questions from visual aids and other references (E12.11.1-E12.11.8).
3. Demonstrate operation of each power tool (E12.11.1-E12.11.12).
4. Have students pass an operation and safety test (E12.11.1-E12.11.8).
5. Have students (one at a time) operate power tools under the close supervision of the instructor (E12.11.9-E12.11.12).
6. As students become proficient in the operation of a power tool, have them supervise another student until all students are able to use safely all power tools (E12.11.1-E12.11.12).
7. Have upper class students who are proficient in using power tools assist the instructor. Be sure this procedure is approved by the administration (E12.11.1-E12.11.12).

SELECTED TOOLS AND MATERIALS

Portable power tools
- Drill
- Router
- Sabre saw
- Circular saw
- Belt sander
- Orbital sander

Stationary machine tools
- Circular saw
- Radical-arm saw
- Band saw
- Drill press
- Jointer
- Planer
- Sander
- Wood lathe

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Wood Shop Machinery. Hobar.
Portable Power Tools. Hobar.

Filmstrips/cassettes: Woodworking Machine Operations Explained. Bergwall Productions, Inc.
Using Portable Power Tools. Hobar.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapters 11-12. Wakeman.
Operator's manuals.
Power Tool Safety and Operation. Hobar.
Safety Exams. Hobar.
Technical Woodworking, Sections 4-5. Groneman and Glazener.
Working in Agricultural Mechanics: Activity Guide and Project Plan Book. Shinn and Weston.

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

TASK/COMPETENCY

12.12 Adjust and maintain power woodworking tools (portable and stationary)

----------------Application---------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

12.12

PERFORMANCE OBJECTIVE

P12.12 Given power woodworking tools, operator's manuals, and the necessary tools, equipment, and supplies, adjust and maintain power woodworking tools. The machine should be adjusted and maintained according to the manufacturer's specifications.

SELECTED ENABLING OBJECTIVES

E12.12.1 Clean power woodworking tools.

E12.12.2 Select needed tools, equipment, and measuring devices for adjusting and maintaining power tools.

E12.12.3 Inspect drive mechanisms and assess proper operation, excessive wear, and breakage.

E12.12.4 Remove and replace worn or damaged parts or cutting mechanisms.

E12.12.5 Level operating surface.

E12.12.6 Adjust guards.

E12.12.7 Lubricate power tools.

E12.12.8 Adjust for proper operation.

E12.12.9 Test machine operation.

CRITERION-REFERENCED MEASURE

C12.12 Power woodworking tools adjusted and maintained according to the manufacturer's specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students read appropriate manuals, adjust, and maintain power tools (E12.12.1-E12.12.9).
2. Observe and assist students when necessary (E12.12.1-E12.12.9).
3. Verify that tools have been adjusted and maintained correctly (E12.12.1-E12.12.9).
4. Have students bring in portable power tools to adjust and maintain (E12.12.1-E12.12.9).

SELECTED TOOLS AND MATERIALS

Maintenance schedule

Portable Power Tools	Stationary Machine Tools
Drill	Circular saw
Router	Radial-arm saw
Sabre saw	Band saw
Circular saw	Drill press
Belt sander	Jointer
Orbital sander	Planer
	Sander
	Wood lathe

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/cassette: Woodworking Machine Operations Explained. Bergwall Productions, Inc.

Transparency: Power Tool Maintenance. Hobar.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapters 11-12. Wakeman.
Operator's manuals.
Power Tool Maintenance, Chapters 6-20. Irvin.
Power Tool Safety and Operation. Hobar.
Technical Woodworking, Sections 4-5. Groneman and Glazener.

---------------Application--------------

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

12.13 Identify types of wood

COURSE

Agricultural Science and
Mechanics II (8008)

12.13

PERFORMANCE OBJECTIVE

P12.13 Given samples of wood, identify types of wood. The samples must be identified by species and as either hardwood or softwood with 90% accuracy on a written or oral test.

SELECTED ENABLING OBJECTIVES

E12.13.1 Describe the general features of hardwood lumber.

E12.13.2 Describe the general features of softwood lumber.

E12.13.3 Differentiate between hardwood and softwood lumber.

E12.13.4 List characteristics of selected woods.

CRITERION-REFERENCED MEASURE

C12.13 Types of wood identified by species name and classified as hardwood or softwood with 90% accuracy on a written or oral test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display and discuss the characteristics of different species of lumber (E12.13.1-E12.13.4).
2. Have students identify samples of lumber (E12.13.4).
3. Have students bring in samples of lumber that are not available at school (E12.13.1-E12.13.4).

SELECTED TOOLS AND MATERIALS

Samples of lumber

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Softwoods, WT-41. Hobar.
Hardwoods, WT-42. Hobar.

SELECTED REFERENCES

Technical Woodworking, Unit 145. Groneman and Glazener.

DUTY AREA

12. PERFORMING AGRICULTURAL WOODWORKING OPERATIONS

TASK/COMPETENCY

12.14 Construct an agricultural woodworking project using power tools

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

12.14

PERFORMANCE OBJECTIVE

P12.14 Given an assignment to construct an agricultural woodworking project and access to the needed power tools, construct an agricultural woodworking project using power tools. Project plans must be approved by the instructor and completed project must conform to the plans and specifications.

SELECTED ENABLING OBJECTIVES

E12.14.1 Select or draw a plan.

E12.14.2 Interpret woodworking plans (Task 12.1).

E12.14.3 Select the needed tools, equipment, supplies, and materials.

E12.14.4 Estimate the time and cost to complete the project.

E12.14.5 Describe the types of skills needed.

E12.14.6 Identify safety practices to follow.

E12.14.7 Evaluate the quality of work done.

E12.14.8 Demonstrate safe use of power woodworking tools.

CRITERION-REFERENCED MEASURE

C12.14 An instructor-approved agricultural woodworking project using power tools constructed, completed project conforming to plans and specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies for agricultural mechanics (E12.14.1, E12.14.2).
2. Have students list the needed tools, equipment, supplies, and materials (E12.14.3).
3. Have students describe procedures to use (E12.14.4, E12.14.5).
4. Verify that students have passed an operations and safety test on power woodworking tools and are able to perform the required competencies (E12.14.6-E12.14.8).
5. Plan approved projects to coincide with SOEPs (E12.14.1-E12.14.8).
6. Observe and provide assistance when needed (E12.14.1-E12.14.8).

SELECTED TOOLS AND MATERIALS

Woodworking plans
Power woodworking tools
Lumber as required by plans

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/cassette: Woodworking Explained: Building a Better Bookshelf. Bergwall Productions, Inc.

SELECTED REFERENCES

Agricultural Mechanics Plans. Hobar.
Agricultural Mechanics Plans for Shop Projects. Instructional Material Laboratory.
Working in Agricultural Mechanics: Activity Guide and Project Plan Book. Shinn and Weston.

DUTY AREA

13. PERFORMING AGRICULTURAL MASONRY AND CONCRETE WORK

TASKS/COMPETENCIES

13.1 Interpret masonry plans

13.2 Identify concrete and masonry tools, equipment, and supplies

13.3 Test sand for silt

13.4 Test sand for organic matter

13.5 Estimate materials for masonry projects

13.6 Construct an approved concrete or masonry project

DUTY AREA

13 PERFORMING AGRICULTURAL MASONRY AND CONCRETE WORK

TASK/COMPETENCY

13.1 Interpret masonry plans

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

13.1

PERFORMANCE OBJECTIVE

P13.1 Given building plans including masonry materials, interpret masonry plans. The quantity and types of masonry materials must be estimated with 90% accuracy.

SELECTED ENABLING OBJECTIVES

E13.1.1 Identify views, dimensions, abbreviations, and symbols as they apply to masonry materials.

E13.1.2 Identify masonry materials needed to complete the project.

E13.1.3 Estimate the quantity and types of masonry materials needed.

CRITERION-REFERENCED MEASURE

C13.1 Masonry plans interpreted by estimating the quantity and types of masonry materials with 90% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies (Duty Area 5) needed in agricultural mechanics (E13.1.1).
2. Using building plans including masonry products, demonstrate and have students identify and estimate the quantity and types of masonry materials needed (E13.1.2, E13.1.3).
3. Have students interpret masonry plans used in their SOEPs (E13.1.1-E13.1.3).

SELECTED TOOLS AND MATERIALS

Building plans including masonry materials

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Concrete Construction Worksheets. Hobar.
Mechanics in Agriculture, Chapter 32. Phipps.
Modern Agricultural Mechanics, Chapter 15. Wakeman.
Technical Woodworking, Unit 164. Groneman and Glazener.

DUTY AREA

13. PERFORMING AGRICULTURAL MASONRY AND CONCRETE WORK

TASK/COMPETENCY

13.2 Identify concrete and masonry tools, equipment, and supplies

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

13.2

PERFORMANCE OBJECTIVE

P13.2 Given a selection of concrete and masonry tools, equipment, and supplies, identify concrete and masonry tools, equipment, and supplies with 90% accuracy on a written or oral test.

SELECTED ENABLING OBJECTIVES

E13.2.1 Select tools, equipment, and supplies used in concrete and masonry work.

E13.2.2 Name the parts of each concrete and masonry tool.

E13.2.3 Describe the uses and functions of concrete and masonry tools, equipment, and supplies.

CRITERION-REFERENCED MEASURE

C13.2 Concrete and masonry tools, equipment, and supplies identified with 90% accuracy on a written or oral test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate the uses of concrete and masonry tools, equipment, and supplies (E13.2.1-E13.2.3).
2. Have students use references to identify concrete and masonry tools, equipment, and supplies (E13.2.2, E13.2.3).
3. Test student identification skills after using (E13.2.1-E13.2.3).
4. Have students prepare a list of concrete and masonry tools at home or in their SOEPs (E13.2.1-E13.2.3).

SELECTED TOOLS AND MATERIALS

Portland cement
Jointer
Brick sets
Groovers
Edgers
Wheelbarrow
Floats
Hammers
Slump tester
Slump cones
Molds
Mortar hoes
Levels
Line
Mortar boards
Mortar box
Mortar mixer
Masonry saws
Masonry drills
Concrete air indicator test
Tampers
Tongs
Trowels
Pointer
Tile markers
Squeegee
Broom
Bricks
Blocks
Aggregate
Screed
Sand
Hydrated lime

SELECTED AUDIOVISUAL MATERIALS

Transparency: The Masonry Trade. Hobar.

SELECTED REFERENCES

Concrete and Concrete Masonry. Hobar.
Mechanics in Agriculture, Chapters 31-32. Phipps.
Modern Agricultural Mechanics, Chapter 15. Wakeman.

DUTY AREA

13. PERFORMING AGRICULTURAL AND CONCRETE WORK

TASK/COMPETENCY

13.3 Test sand for silt

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

13.3

PERFORMANCE OBJECTIVE

P13.3 Given samples of sand and needed equipment, test sand for silt. Determine the amount of silt (within ± 1/16 inch) by measurement.

SELECTED ENABLING OBJECTIVES

E13.3.1 Explain the necessity of using clean, washed sand.

E13.3.2 Mix sand and water in jar.

E13.3.3 Shake mixture for one minute.

E13.3.4 Measure the amount of silt on top of sand after the water clears.

CRITERION-REFERENCED MEASURE

C13.3 Sand tested for silt by measuring (within ± 1/16 inch) silt formation on top of sand after siltration test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the siltration test on several samples of sand with different quantities of silt (E13.3.2-E13.3.4).

2. Display examples of concrete made with excess silt. Point out the characteristics of poor quality concrete (E13.3.1).

SELECTED TOOLS AND MATERIALS

Quart glass jar
Samples of sand
Water (clean)

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Concrete Improvement for Farm and Home. University of Illinois.
Modern Agricultural Mechanics, Chapter 15. Wakeman.
Vocational Agriculture Student Farm Shop Manual. Pynnonen.

DUTY AREA

13. PERFORMING AGRICULTURAL MASONRY AND CONCRETE WORK

TASK/COMPETENCY

13.4 Test sand for organic matter

---------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

13.4

PERFORMANCE OBJECTIVE

P13.4 Given samples of sand, needed equipment and supplies, test sand for organic matter by mixing with lye and water. Determine the quantity of organic matter by distinguishing with 100% accuracy the color of the liquid after the test.

SELECTED ENABLING OBJECTIVES

E13.4.1 Explain the necessity of using sand without an excessive amount of organic matter.

E13.4.2 Identify practices to follow when using lye.

E13.4.3 Dissolve lye in water.

E13.4.4 Mix sand with lye water solution.

E13.4.5 Shake the mixture.

E13.4.6 Distinguish the color of the liquid after 24 hours.

CRITERION-REFERENCED MEASURE

C13.4 Sand tested for organic matter by mixing with lye and water and distinguishing with 100% accuracy the color of the liquid after the test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the organic test on several samples of sand with different quantities of organic matter (E13.4.2-E13.4.6).
2. Display examples of concrete made with excess quantities of organic matter (E13.4.1).

SELECTED TOOLS AND MATERIALS

Quart glass jar
Samples of sand
Household lye

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Concrete Improvements for Farm and Home. University of Illinois.
Modern Agricultural Mechanics, Chapter 15. Wakeman.
Vocational Agriculture Student Farm Shop Manual. Pynnonen.

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DUTY AREA

13. PERFORMING AGRICULTURAL MASONRY AND CONCRETE WORK

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

13.5 Estimate materials for masonry projects

COURSE

Agricultural Science and Mechanics I (8006)

13.5

PERFORMANCE OBJECTIVE

P13.5 Given masonry plans and specifications for a project, estimate materials for masonry projects. Estimate must be within 10% of the amount of materials needed for the project.

SELECTED ENABLING OBJECTIVES

E13.5.1 Identify dimensions of the project.

E13.5.2 Identify types of materials required.

E13.5.3 Estimate amount of concrete required.

E13.5.4 Estimate aggregate requirements.

E13.5.5 Identify types and quantity of forms required.

E13.5.6 Identify types and estimate amounts of expansion materials.

E13.5.7 Identify types and estimate amount of reinforcement materials.

E13.5.8 Estimate set and retarder materials.

E13.5.9 Prepare written estimate of materials needed.

CRITERION-REFERENCED MEASURE

C13.5 Materials needed for masonry projects estimated within 10% of the amount of materials needed.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the procedures for estimating materials (E13.5.1-E13.5.9).
2. Have students practice estimating materials for masonry projects they could construct for home use (E13.5.1-E13.5.9).

SELECTED TOOLS AND MATERIALS

Masonry plans and specifications

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Concrete Improvements for Farm and Home. University of Illinois.
Modern Plans for Modern Farms. Portland Cement Association.

DUTY AREA

13. PERFORMING AGRICULTURAL MASONRY AND CONCRETE WORK

TASK/COMPETENCY

13.6 Construct an approved concrete or masonry project

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

13.6

PERFORMANCE OBJECTIVE

P13.6 Given an assignment to construct a concrete or masonry project and access to needed tools, equipment, and supplies, construct an approved concrete or masonry project. The completed project must conform to plans and specifications.

SELECTED ENABLING OBJECTIVES

E13.6.1 Select or draw a plan.

E13.6.2 Interpret masonry plans (Task 13.1).

E13.6.3 Estimate materials for project (Task 13.5).

E13.6.4 Estimate the time and cost to complete the project.

E13.6.5 Describe the types of skills needed.

E13.6.6 Identify safety practices to follow.

E13.6.7 Evaluate the quality of work done.

E13.6.8 Demonstrate safe use of concrete and masonry tools.

CRITERION-REFERENCED MEASURE

C13.6 Instructor-approved concrete or masonry project constructed, conforming to plans and specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies for agricultural mechanics (E13.6.1, E13.6.2).
2. Have students estimate the time and materials required and cost to complete the project (E13.6.3-E13.6.5).
3. Have students describe procedures to use (E13.6.5-E13.6.8).
4. Verify that students have passed a safety test on the use of masonry tools and equipment (E13.6.1-E13.6.8).
5. Plan approved projects to coincide with SOEPs (E13.6.1-E13.6.8).
6. Observe and provide assistance when needed (E13.6.1-E13.6.8).

SELECTED TOOLS AND MATERIALS

Masonry plans
Masonry tools and supplies

SELECTED AUDIOVISUAL MATERIALS

Slides: Concrete Masonry. Ohio Curriculum Materials.

SELECTED REFERENCES

Concrete Improvements for Farm and Home. University of Illinois.
Mechanics in Agriculture, Chapters 31-32. Phipps.
Modern Agricultural Mechanics, Chapter 15. Wakeman.
Recommended Practice for Building With Concrete Masonry. University of Illinois.

DUTY AREA

14. OPERATING HAZARDOUS FARM EQUIPMENT

TASKS/COMPETENCIES

14.1 Demonstrate the importance of working safely with hazardous farm equipment

14.2 Perform daily maintenance and safety checks of hazardous farm equipment

14.3 Attach farm implements to tractor

14.4 Demonstrate universal hand signals of tractor operation

14.5 Operate tractor safely

14.6 Use communication equipment

DUTY AREA

14. OPERATING HAZARDOUS FARM EQUIPMENT

TASK/COMPETENCY

14.1 Demonstrate the importance of working safely with hazardous farm equipment

---------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

14.1

PERFORMANCE OBJECTIVE

P14.1 Given access to farm equipment and resources on farm equipment safety, demonstrate the importance of working safely with hazardous farm equipment by locating and explaining statistics on accidents, recognizing hazards with 90% accuracy, and explaining how farm equipment accidents can be prevented.

SELECTED ENABLING OBJECTIVES

E14.1.1 Locate statistics on farm equipment accidents.

E14.1.2 List possible physical conditions of farm equipment which cause accidents.

E14.1.3 List human conditions which cause farm equipment accidents.

E14.1.4 Recognize common machinery hazards.

E14.1.5 Explain what operators can do to prevent accidents.

E14.1.6 Explain how personal protective equipment can be used to prevent accidents with farm equipment.

CRITERION-REFERENCED MEASURE

C14.1 The importance of working safely with hazardous farm equipment demonstrated by locating and explaining statistics on accidents, recognizing hazards with 90% accuracy, and explaining how farm equipment accidents can be prevented.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have the students review resources on farm equipment safety (E14.1.1-E14.1.6).
2. Have students study individual machines and make safety reports (E14.1.2-E14.1.6).

SELECTED TOOLS AND MATERIALS

Farm safety statistics
Farm equipment
Personal protective equipment
(ear plugs, gloves, safety glasses, hard hat, bump hat)

SELECTED AUDIOVISUAL MATERIALS

Slides/cassettes: Safe Use of Farm Machinery - Movement on the Public Roads. Agricultural Engineering Department, Virginia Polytechnic Institute and State University.

Why Should I Use a ROPS? Agricultural Engineering Department, Virginia Polytechnic Institute and State University.

SELECTED REFERENCES

Roll Over Protective Structures for Tractors-OSHA, ME-92. Extension Services, Virginia Polytechnic Institute and State University.
Safe Operation of Agricultural Equipment. Hobar.
Safe Tractor Operation and Daily Care. AAVIM.

----------------Application--------------

DUTY AREA

14. OPERATING HAZARDOUS FARM EQUIPMENT

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

14.2 Perform daily maintenance and safety checks of hazardous farm equipment

COURSE

Agricultural Science and Mechanics I (8006)

14.2

PERFORMANCE OBJECTIVE

P14.2 Given farm equipment, operator's manuals, and needed supplies, perform daily maintenance and safety checks on hazardous farm equipment. All daily maintenance and safety checks must be made according to operator's manuals.

SELECTED ENABLING OBJECTIVES

E14.2.1 List advantages of performing daily maintenance and safety checks.

E14.2.2 Locate daily maintenance recommendations and safety checks in operator's manuals.

E14.2.3 Identify and list maintenance needs.

E14.2.4 Identify supplies needed by name and number.

E14.2.5 Develop a maintenance schedule.

E14.2.6 Identify safety hazards involved in daily maintenance.

E14.2.7 Record daily maintenance services.

CRITERION-REFERENCED MEASURE

C14.2 Daily maintenance and safety checks of hazardous farm equipment performed according to operator's manuals.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students study the importance of daily maintenance and safety checks through the use of references and visual aids (E14.2.1).
2. Demonstrate the procedures to follow in performing daily maintenance and safety checks (E14.2.1-E14.2.7).
3. Have students visit a machinery dealership to observe maintenance of machinery (E14.2.1, E14.2.3-E14.2.6).
4. Have students perform daily maintenance on school machinery and machinery used in their SOEPs (E14.2.1-E14.2.7).

SELECTED TOOLS AND MATERIALS

Operator's manuals
Farm equipment

SELECTED AUDIOVISUAL MATERIALS

Slides/cassette: Safe Use of Farm Machinery - Repair and Maintenance (available on loan). Agricultural Engineering Department, Virginia Polytechnic Institute and State University.

SELECTED REFERENCES

Checklist for Winterizing and Maintaining Machinery. Smith.
Grounds Keeping Equipment, Vol. 1. AAVIM.
Preventive Maintenance, Chapter 1. John Deere.
Safe Operation of Agricultural Equipment, Unit 3. Hobar.
Safe Tractor Operation and Daily Care. AAVIM.

----------------Application--------------

DUTY AREA

14. OPERATING HAZARDOUS FARM EQUIPMENT

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

14.3 Attach farm implements to tractor

COURSE

Agricultural Science and Mechanics I (8006)

14.3

PERFORMANCE OBJECTIVE

P14.3 Given access to farm implements and a tractor, attach farm implements to tractor. Operator must connect implements without damage to the tractor or implements.

SELECTED ENABLING OBJECTIVES

E14.3.1 Locate information on connecting equipment in the operator's manual.

E14.3.2 Identify safety practices to follow.

E14.3.3 Describe the procedures to follow.

E14.3.4 Prepare tractor and implement for attachment.

E14.3.5 Disconnect implement.

CRITERION-REFERENCED MEASURE

C14.3 Farm implements attached to tractor following safety precautions and without damaging the tractor or implements.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students study the means of connecting farm implements to tractors (E14.3.1-E14.3.5).
2. Verify that students have passed a safety test on the operation and safety of tractors and equipment (E14.3.1-E14.3.5).
3. Have students practice in groups if more than one tractor is available (E14.3.3-E14.3.5).
4. Supervise and provide assistance when needed (E14.3.1-E14.3.5).

SELECTED TOOLS AND MATERIALS

Operator's manual (tractor and implements)
Tractor
Farm implements
Safety test on operation of tractor and equipment

SELECTED AUDIOVISUAL MATERIALS

Slides: Agricultural Safety. John Deere.

SELECTED REFERENCES

Agricultural Machinery Safety. John Deere.
Safe Operation of Agricultural Equipment. Hobar.
Safe Tractor Operation and Daily Care. AAVIM.

DUTY AREA

14. OPERATING HAZARDOUS FARM EQUIPMENT

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

14.4 Demonstrate universal hand signals of tractor operation

COURSE

Agricultural Science and Mechanics I (8006)

14.4

PERFORMANCE OBJECTIVE

P14.4 Given a simulated situation requiring the need for hand signals and information on hand signals, demonstrate universal hand signals of tractor operation with 95% accuracy.

SELECTED ENABLING OBJECTIVES

E14.4.1 Identify hand signals for tractor operation.

E14.4.2 Draw stick figures indicating hand signals.

E14.4.3 Identify errors in giving hand signals.

CRITERION-REFERENCED MEASURE

C14.4 Universal hand signals of tractor operation demonstrated with 95% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students locate universal hand signals in references (E14.4.1).
2. Have students draw stick figures using hand signals (E14.4.2).
3. Have students practice using hand signals in groups (E14.4.3).

SELECTED TOOLS AND MATERIALS

None identified

SELECTED AUDIOVISUAL MATERIALS

Transparency: Hand Signals in Agricultural Safety, John Deere.
Slides: Hand Signals in Agriculture. Agricultural Engineering Department, Virginia Polytechnic Institute and State University.

SELECTED REFERENCES

Agricultural Machinery Safety. John Deere.

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DUTY AREA

14. OPERATING HAZARDOUS FARM EQUIPMENT

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

14.5 Operate tractor safely

COURSE

Agricultural Science and Mechanics II (8008)

14.5

PERFORMANCE OBJECTIVE

P14.5 Given a tractor, safety instructions, and a prescribed operating course, operate tractor safely. Operate tractor safely by inspecting the tractor, passing an operator's safety test, and operating the tractor through a prescribed operating course.

SELECTED ENABLING OBJECTIVES

E14.5.1 Identify laws pertaining to operating a tractor.

E14.5.2 Locate information in an operator's manual.

E14.5.3 Locate controls.

E14.5.4 Describe the meaning of symbols on the instrument panel.

E14.5.5 Identify safety features available.

E14.5.6 Pass an operator's safety test.

E14.5.7 Describe the personal characteristics of a safe tractor operator.

E14.5.8 Identify safe operating practices which decrease the chances of accidents.

E14.5.9 Describe the correct start-up and shut-down procedures.

E14.5.10 Prepare tractor for operation.

CRITERION-REFERENCED MEASURE

C14.5 Tractor operated safely by inspecting the tractor, passing an operator's safety test, and operating a tractor through a prescribed operating course.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students locate laws on tractor operation, study operator's manuals and references on driver characteristics, complete the learning activity package on Checking Tractor Safety, and pass an operator's safety test (E14.5.1-E14.5.10).
2. Set up a tractor operating course with terrain features simulating actual field conditions, e.g. inspecting, starting, using hydraulic controls, maneuvering through different types of terrain, backing-up, stopping, and shutting-down (E14.5.1-E14.5.10).
3. Have students develop confidence and demonstrate safe operator characteristics on simple tasks before being allowed to participate in computer simulation activities (E14.5.1-E14.5.10).

SELECTED TOOLS AND MATERIALS

Operator's manual
Tractor

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/cassette: Tractor Operation and Safety. Bergwall Productions, Inc.
Slides: Tractor Tragedy. Agricultural Engineering Department, Virginia Polytechnic Institute and State University.
Movies: Tractor Safety. Agricultural Engineering Department, Virginia Polytechnic Institute and State University.
Tractor Safety for Use in Agriculture. Agricultural Engineering Department, Virginia Polytechnic Institute and State University.

SELECTED REFERENCES

Checking Tractor Safety (LAP). Virginia Department of Education.
Employer's Guide For Training Employed Tractor Operators, ME-91. Extension Service, Virginia Polytechnic Institute and State University.
Safe Tractor Operation and Daily Care. AAVIM.

DUTY AREA

14 OPERATING HAZARDOUS FARM EQUIPMENT

TASK/COMPETENCY

14.6 Use communication equipment

---------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

14.6

PERFORMANCE OBJECTIVE

P14.6 Given communication equipment such as a C.B. or two-way radio, use communication equipment. Operator should be able to adjust and transmit a message with 90% accuracy.

SELECTED ENABLING OBJECTIVES

E14.6.1 Describe the laws and regulations applying to communication equipment.

E14.6.2 Explain the function of each item on the instrument panel.

E14.6.3 Adjust items on the instrument panel.

E14.6.4 Make radio contact with another station, transmit a message, and sign off.

CRITERION-REFERENCED MEASURE

C14.6 Communication equipment used by correctly adjusting and transmitting a message with 90% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students study sub-part D of the Rules and Regulations of the Federal Communications Commission (E14.6.1).

2. Have students simulate use of equipment by practicing or use walkie-talkies in small groups (E14.6.1-E14.6.4).

SELECTED TOOLS AND MATERIALS

Operator's manual
Rules and Regulations of the FCC-- sub-part D (004-000-00427-2).
Two-way radio

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

None identified

DUTY AREA

15. ANALYZING SOIL FACTORS

TASKS/COMPETENCIES

15.1 Describe the nature of soil

15.2 Explain the importance of soils

15.3 Explain soil formation processes

15.4 Analyze soil profiles

15.5 Determine soil texture

15.6 Analyze soil structure

15.7 Analyze soil color

15.8 Take soil samples

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DUTY AREA

15. ANALYZING SOIL FACTORS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

15.1 Describe the nature of soil

COURSE

Agricultural Science and Mechanics I (8006)

15.1

PERFORMANCE OBJECTIVE

P15.1 Given a sample of soil, describe the nature of soil by defining the purpose and describing the general composition of all four of the major components of soil. Description must conform to instructor-prepared checklist.

SELECTED ENABLING OBJECTIVES

E15.1.1 Define soil and soil related terms.

E15.1.2 Describe the composition of the four major components of soil.

CRITERION-REFERENCED MEASURE

C15.1 Composition of all four of the major components of soil defined and described according to instructor-prepared checklist.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students observe (on a class field trip or individual walk) differences in areas regarding their ability to support plant growth. Report on the areas that have no plants or sparse vegetation and those that are heavily vegetated. Describe the type of soil conditions that exist in each situation (E15.1.1, E15.1.2).
2. Conduct classroom experiment to demonstrate that soils differ in their ability to support plant life (E15.1.1, E15.1.2).
3. Have students identify specimens of soil with varying composition of minerals, organic matter, water, and air (E15.1.1, E15.1.2).

SELECTED TOOLS AND MATERIALS

Pots for growing demonstration
Samples of different compositions of soil
Beans to plant
Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Composition of Good Soil, p. 5-15, Illustrated Horticulture. Virginia Department of Education.
Composition of Average Soil, in Air, Soil and Water Handbook. Virginia Department of Education.

SELECTED REFERENCES

Conserving Soil, (Activity Master 1-- "Soils: What are They?"). Soil Conservation Service, U.S. Department of Agriculture.
Illustrated Horticulture, Soil Section. Virginia Department of Education.

DUTY AREA

15. ANALYZING SOIL FACTORS

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

15.2 Explain the importance of soils

COURSE

Agricultural Science and Mechanics I (8006)

15.2

PERFORMANCE OBJECTIVE

P15.2 Given resources on soils, explain the importance of soils by listing on a written test five of the seven statements of importance on Handout 15.2.

SELECTED ENABLING OBJECTIVES

E15.2.1 Explain how supply and demand for resources affect their importance.

E15.2.2 Explain how the soil sustains all life through a natural chain.

E15.2.3 List major categories of human needs which are supported by the soil.

E15.2.4 List benefits of natural resources management.

CRITERION-REFERENCED MEASURE

C15.2 Importance of soils explained by listing five of the seven statements of importance on Handout 15.2 on a written test.

HANDOUT 15.2

DUTY: Analyzing Soil Factors

Task: Explain the importance of soils

Why Soils Are Important

1. Plants grow in and on soil.
2. Plants support animal life.
3. Plants and animals support human life.
4. World population is rapidly increasing.
5. A large part of the world's population has inadequate nutrition.
6. World supply of productive soil is limited.
7. Improved soil management could feed more people.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students report on what happens when there is a low supply of natural resources (E15.2.1).
2. Have students develop (on paper) the natural chain of life (E15.2.2).
3. Have students give two examples of human needs that are supported by the soil in producing clothing, shelter and furnishings, energy, and other products (E15.2.3).
4. Have students report on the purposes and benefits of natural resources management (E15.2.4).

SELECTED TOOLS AND MATERIALS

Handout 15.2--Why Soils are Important

SELECTED AUDIOVISUAL MATERIALS

Transparency: People and the Soil (AV-1) in Air, Soil and Water Handbook. Virginia Department of Education.

SELECTED REFERENCES

Air, Soil and Water Handbook. Virginia Department of Education.

---------------Application--------------

DUTY AREA

15. ANALYZING SOIL FACTORS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

15.3 Explain soil formation processes

COURSE

Agricultural Science and Mechanics I (8006)

15.3

PERFORMANCE OBJECTIVE

P15.3 Given resources on soils, explain soil formation processes to include how parent material, climate, living organism, topography, and time are related to soil formation. Explanations must conform to instructor's specifications.

SELECTED ENABLING OBJECTIVES

E15.3.1 Explain the five soil formation factors.

E15.3.2 Identify biological organisms found in the soil.

E15.3.3 Explain how biological organisms affect soil formation.

E15.3.4 Identify soil parent materials.

E15.3.5 Describe characteristics of parent materials.

E15.3.6 Explain why different types of parent material produce different types of soils.

CRITERION-REFERENCED MEASURE

C15.3 Soil formation processes explained in conformity with specifications provided by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Collect and identify in class rocks relative to soil formation in the area (E15.3.1-E15.3.6).
2. Take a field trip to a highway cut to observe how the soil is related to the parent material (E15.3.1-E15.3.6).
3. Collect samples of organic matter from the top of a hill, from a slope, and from the bottom of a deep valley. Compare the samples for moisture and organic matter content (E15.3.1-E15.3.6).
4. Collect soil organisms for display in class (E15.3.2).
5. Set up an ant farm in the classroom (E15.3.3).

SELECTED TOOLS AND MATERIALS

How is Soil Formed? (Activity Master 3) in Conserving Soil. U.S. Department of Agriculture
Samples of several types of parent material
Soil
Ant farm

SELECTED AUDIOVISUAL MATERIALS

Film: The Story of Soil (63408). Virginia Department of Education.

SELECTED REFERENCES

Air, Soil and Water Handbook. Virginia Department of Education.
Land Appreciation and Soil Evaluation in Virginia. Lietzke et al.

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DUTY AREA

15. ANALYZING SOIL FACTORS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

15.4 Analyze soil profiles

COURSE

Agricultural Science and Mechanics I (8006)

15.4

PERFORMANCE OBJECTIVE

P15.4 Given soil profiles, analyze the profiles. The analysis must agree with the analysis prepared by the instructor.

SELECTED ENABLING OBJECTIVES

E15.4.1 Define a soil profile.

E15.4.2 Describe the characteristics of a typical soil profile.

E15.4.3 Locate the boundaries of each horizon.

E15.4.4 Determine soil depth.

E15.4.5 Explain the advantages of a deep soil versus a shallow soil.

CRITERION-REFERENCED MEASURE

C15.4 Soil profiles analyzed, each analysis agreeing with the instructor-prepared analysis.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Using a soil profile transparency, examine the distinguishing characteristics of a typical soil profile (E15.4.1-E15.4.3).
2. Inspect real soil profiles from a monolith (E15.4.1-E15.4.3).
3. Examine the physical features of the soil horizons from a road cut (E15.4.1-E15.4.3).
4. Have students compare the physical features of soil profiles found near their homes with actual monoliths (E15.4.1-E15.4.3).
5. Have students differentiate between actual soil profiles and typical soil profiles (E15.4.1-E15.4.3).
6. Have students measure soil depth and point out the advantages of a deep soil over a shallow soil (E15.4.4, E15.4.5).
7. Have students compare the growth of seeds in an "A" horizon and a "B" horizon (E15.4.1-E15.4.5).

SELECTED TOOLS AND MATERIALS

Soil profile monoliths
Rule
Soil from "A" horizon in which to grow seeds
Soil from "B" horizon in which to grow seeds
What are Soil Horizons? (Activity Master 4) in Conserving Soil. U.S. Department of Agriculture.
How Do Soils Differ? (Activity Master 5) in Conserving Soil. U.S. Department of Agriculture.

SELECTED AUDIOVISUAL MATERIALS

Transparency: A Soil Profile in Conserving Soil. U. S. Department of Agriculture.
Slide: Soil Profile Slides. National Plant Food Institute.
Film: The Depth of Our Roots. New Holland.

SELECTED REFERENCES

Air, Soil and Water Handbook. Virginia Department of Education.
Land Appreciation and Soil Evaluation in Virginia. Lietzke et al.
What is Soil? Miller.

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DUTY AREA

15. ANALYZING SOIL FACTORS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

15.5 Determine soil texture

COURSE

Agricultural Science and Mechanics I (8006)

15.5

PERFORMANCE OBJECTIVE

P15.5 Given a sample of soil, determine soil texture. Determination must agree with that of the instructor.

SELECTED ENABLING OBJECTIVES

E15.5.1 Define texture.

E15.5.2 Compare the physical features of soil samples.

E15.5.3 Identify soil particles according to size.

E15.5.4 Determine the percentage of sand, silt, and clay in a soil sample (wet method).

E15.5.5 Classify a soil sample by the feel test.

E15.5.6 Describe the use of the soil texture triangle.

E15.5.7 Explain the influence soil texture has on the physical characteristics of the soil and its effect on plant growth.

CRITERION-REFERENCED MEASURE

C15.5 Soil texture determined, determination agreeing with that of the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students identify and compare soil particles according to size (E15.5.1-E15.5.3).
2. Have students practice classifying soil using the wet and dry method (E15.5.4, E15.5.5).
3. Have students practice using the soil texture triangle to classify soils (E15.5.6).
4. Compare the physical soil characteristics and plant growth on several areas with different soil textures (E15.5.7).

SELECTED TOOLS AND MATERIALS

Quart jars
Soil samples
Soil texture triangle
Sand, silt, and clay samples
Soil monoliths
How Do Soils Differ? (Activity Master 5) in Conserving Soil. U.S. Department of Agriculture.

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Characteristics of the Various Soil Classes, in Air, Soil and Water Handbook. Virginia Department of Education.
Textural Groups and Soil Textures, in Air, Soil and Water Handbook. Virginia Department of Education.
The Texture Triangle, in Air, Soil and Water Handbook. Virginia Department of Education.
Soil Texture Classes, in Air, Soil and Water Handbook. Virginia Department of Education.
Film: Soil Texture. University of Illinois.

SELECTED REFERENCES

Air, Soil and Water Handbook. Virginia Department of Education.
Land Appreciation and Soil Education in Virginia. Lietzke et al.
Physical Features of Soil. Miller.

---------------Application--------------

DUTY AREA
15. ANALYZING SOIL FACTORS

PROGRAM
AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY
15.6 Analyze soil structure

COURSE
Agricultural Science and Mechanics I (8006)

15.6

PERFORMANCE OBJECTIVE

P15.6 Give a sample of soil, analyze soil structure. The analysis must agree with that of the instructor.

SELECTED ENABLING OBJECTIVES

E15.6.1 Define soil structure.

E15.6.2 Describe the physical features of soil samples.

E15.6.3 Identify and describe types of soil structure.

E15.6.4 Match soil structures to the typical horizon in the soil profile.

E15.6.5 Describe six factors that influence formation of soil structure.

CRITERION-REFERENCED MEASURE

C15.6 Soil structure analyzed, the analysis agreeing with that of the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students identify and compare soil structure using monoliths and road cuts (E15.6.1-E15.6.5).
2. Have students draw and label different structures of soil (E15.6.1-E15.6.5).
3. Have students observe and describe how soil structure is formed (E15.6.5).

SELECTED TOOLS AND MATERIALS

Examples of soil structure
Soil monoliths
Blocks of soil (undisturbed)

SELECTED AUDIOVISUAL MATERIALS

Transparency: Kinds of Soil Structure, in Air, Soil and Water Handbook. Virginia Department of Education.
Filmstrip: Soil Structure. University of Illinois.

SELECTED REFERENCES

Air, Soil and Water Handbook. Virginia Department of Education.
Physical Features of Soil. Miller.

---------------Application--------------

DUTY AREA

15. ANALYZING SOIL FACTORS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

15.7 Analyze soil color

COURSE

Agricultural Science and Mechanics I (8006)

15.7

PERFORMANCE OBJECTIVE

P15.7 Given a soil sample, analyze soil color. The analysis must agree with that of the instructor.

SELECTED ENABLING OBJECTIVES

E15.7.1 Identify the different soil colors.

E15.7.2 Describe the conditions that cause soil color.

E15.7.3 List two reasons for determining soil color.

E15.7.4 Use a color field guide to match soil to the proper color.

CRITERION-REFERENCED MEASURE

C15.7 Soil color analyzed, the analysis agreeing with that of the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students practice analyzing soil color (E15.7.1-E15.7.4).
2. Have each student bring in a soil sample and identify the soil group to which it belongs (E15.7.1-E15.7.4).
3. Take field trips to observe soil colors. Identify factors which have caused the soil color (E15.7.1-E15.7.4).

SELECTED TOOLS AND MATERIALS

Soil sample
Color field guide

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Soil Color. University of Illinois.

SELECTED REFERENCES

Air, Soil and Water Handbook. Virginia Department of Education.
Land Appreciation and Judging in Virginia. Lietzke et al.
What is Soil? Miller.

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DUTY AREA

15. ANALYZING SOIL FACTORS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

15.8 Take soil samples

COURSE

Agricultural Science and Mechanics I (8006)

15.8

PERFORMANCE OBJECTIVE

P15.8 Given a field area, spade, soil auger, plastic bags or other suitable containers, take soil samples according to the directions of the instructor. Samples must be representative of the area.

SELECTED ENABLING OBJECTIVES

E15.8.1 Explain reasons for taking soil samples.

E15.8.2 Identify the general area and spot locations.

E15.8.3 Collect soil.

E15.8.4 Mix the soil from all locations into one sample.

E15.8.5 Label the sample.

E15.8.6 Prepare a form to accompany the sample.

CRITERION-REFERENCED MEASURE

C15.8 Soil samples taken according to instructor's directions, samples representative of the field area.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students practice taking soil samples (E15.8.1-E15.8.6).
2. Have students take samples of fields at home, garden plots, and/or athletic field (E15.8.1-E15.8.6).
3. Demonstrate how to complete the sample form and label the sample (E15.8.5).
4. Demonstrate proper depth for soil sampling as it pertains to the crop being grown (E15.8.1-E15.8.4).

SELECTED TOOLS AND MATERIALS

Bucket
Hand trowel
Plastic bags
Soil auger
Spade
Soil testing information sheet
Soil test boxes

SELECTED AUDIOVISUAL MATERIALS

Slides: How to Take a Soil Sample. Material Plant Food Institute.

Transparencies: Dividing a Field to be Sampled in Air, Soil and Water Handbook. Virginia Department of Education.
Using Sampling Tools in Air, Soil and Water Handbook. Virginia Department of Education.

SELECTED REFERENCES

Air, Soil and Water Handbook. Virginia Department of Education.
Soils--Testing Soil. Richard.
Taking Soil Samples (LAP). Virginia Department of Education.

DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

TASKS/COMPETENCIES

16.1 Germinate seeds

16.2 Propagate plants asexually

16.3 Prepare a seedbed

16.4 Identify environmental requirements for plant growth

16.5 Determine plant nutritive requirements

16.6 Determine the amount of plant nutrients to apply

16.7 Interpret a fertilizer analysis

16.8 Apply plant nutrients

16.9 Select seed

16.10 Plant crop

16.11 Compare methods of weed control

16.12 Describe factors that determine time and frequency of cultivation

16.13 Identify types of cultivation equipment

16.14 Identify ways to procure equipment

16.15 Cultivate crops

16.16 Clean and store equipment

DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

TASK/COMPETENCY

16.1 Germinate seeds

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

16.1

PERFORMANCE OBJECTIVE

P16.1 Given a sample of crop seeds, germinate seeds. Results must meet the specifications provided in class.

SELECTED ENABLING OBJECTIVES

E16.1.1 Label the parts of a seed.

E16.1.2 Describe the function of each part of a seed.

E16.1.3 Explain seed dormancy.

E16.1.4 Define germination.

E16.1.5 Define scarification of seed.

E16.1.6 List the requirements for germination.

E16.1.7 Explain the procedures for determining germination.

E16.1.8 Conduct a germination test.

CRITERION-REFERENCED MEASURE

C16.1 Seeds germinated, results meeting specifications provided in class.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Using a transparency, discuss the functions of the various parts of a seed. Have students label parts and explain the functions (E16.1.1, E16.1.2).
2. Demonstrate how to conduct a germination test. Discuss factors of germination, and have students vary one factor affecting germination. Determine percentage of germination (E16.1.3-E16.1.8).
3. Have students determine the germination percentage of crop seed before planting at home (E16.1.8).

SELECTED TOOLS AND MATERIALS

Seed
Water
Germination medium
  a. blotter and glass
  b. paper towel
  c. soil

SELECTED AUDIOVISUAL MATERIALS

Transparency : Parts of a Seed. NASCO.

SELECTED REFERENCES

Crop Production. Metcalf and Elkins.
Horticulture: A Basic Awareness, pp. 59-62. Baudendistel.
Plant Reproduction. Virginia Cooperative Extension Service.
Planting, Chapter 1. Deere and Company.

DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

TASK/COMPETENCY

16.2 Propagate plants asexually

---------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

16.2

PERFORMANCE OBJECTIVE

P16.2 Given the necessary plants and materials, propagate plants asexually. Propagation must be performed according to an instructor-prepared worksheet.

SELECTED ENABLING OBJECTIVES

E16.2.1 Identify the parts of a plant.

E16.2.2 Explain the functions of the parts of a plant.

E16.2.3 Define terms associated with propagation.

E16.2.4 Identify tools used in propagation.

E16.2.5 Identify safety procedures to follow in propagating plants.

E16.2.6 Describe conditions necessary for asexual reproduction.

E16.2.7 Propagate plants by means of cuttings.

E16.2.8 Propagate plants by means of division.

E16.2.9 Propagate plants by means of layering.

CRITERION-REFERENCED MEASURE

C16.2 Plants propagated asexually, according to instructor-prepared worksheet.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Using a transparency and overlays, discuss the functions of the various parts of a plant. Have students label the parts on a worksheet (E16.2.1, E16.2.2).
2. Demonstrate the propagation of plants from roots, stems, or leaf cuttings. Use greenhouse facilities, if available (E16.2.3-E16.2.6).
3. Observe asexual propagation at a nursery (E16.2.3-E16.2.6).
4. Have students practice propagating cuttings of dogwood, grape vine, jumpers, or pine cuttings (E16.2.7).
5. Have students propagate Irish and sweet potatoes by division (E16.2.8).
6. Have students propagate strawberry plants by layering (E16.2.9).

SELECTED TOOLS AND MATERIALS

Cuttings from parent material
Propagating knife
Rooting media
Rooting hormone
Water
Strawberry plant with runners
Instructor-prepared worksheet
Irish and sweet potatoes

SELECTED AUDIOVISUAL MATERIALS

Transparency: Plant Propagation. NASCO.

Transparency Masters: Parts of Plant, p. 65D and Parts of Stem, p. 69D, Vocational Agriculture Education II. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Illustrated Horticulture, Plant Propagation Section. Virginia Department of Education.
Introductory Horticulture, Units 10-15. Reily and Shry.
Plant Reproduction. Virginia Cooperative Extension Service.
Working in Horticulture, Chapter 9. Richardson and Moore.

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DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

16.3 Prepare a seed bed

COURSE

Agricultural Science and Mechanics I (8006)

16.3

PERFORMANCE OBJECTIVE

P16.3 Given access to tractor and equipment, prepare a seedbed for a selected crop. The seedbed must be free of clods and clumps, level, loose, and moist.

SELECTED ENABLING OBJECTIVES

E16.3.1 Describe the characteristics of a good seedbed.

E16.3.2 List the functions of tillage tools.

E16.3.3 Describe how to prepare a good seedbed.

E16.3.4 Demonstrate safety in land preparation.

E16.3.5 Select machinery to be used.

E16.3.6 Plow land.

E16.3.7 Disk land.

E16.3.8 Harrow land.

E16.3.9 Subsoil land.

E16.3.10 Row up (bed) land.

CRITERION-REFERENCED MEASURE

C16.3 Seedbed prepared, bed free of clods and clumps, level, loose, and moist.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Visit an area where the land has been tilled and discuss the characteristics of a good seedbed and the type of tillage tools used (E16.3.1, E16.3.2).
2. Demonstrate and have students prepare a seedbed on the land laboratory (E16.3.3-E16.3.10).
3. Refer to Duty Area 14 for Operating Hazardous Farm Equipment (E16.3.4).
4. Have students prepare seedbed for specific crops on the land laboratory (E16.3.4-E16.3.10).

SELECTED TOOLS AND MATERIALS

- Plow
- Disk
- Drag
- Harrow
- Rotary tiller
- Culti-packer
- Minimum tillage equipment
- Tractor

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/cassette: Techniques in Land Preparation. NASCO.

SELECTED REFERENCES

Crop Production--Farmer, Cash Grain. V-TECS.
Tillage. Deere and Company.

DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

TASK/COMPETENCY

16.4 Identify environmental requirements for plant growth

---------------Application-------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

16.4

PERFORMANCE OBJECTIVE

P16.4 Given a selection of growing plants, identify environmental requirements for plant growth with 85% accuracy.

SELECTED ENABLING OBJECTIVES

E16.4.1 Describe the functions of climate, water, light, air, and temperature relative to plant growth.

E16.4.2 Identify environmental deficiency symptoms.

E16.4.3 Describe how specific deficiencies affect plant growth.

CRITERION-REFERENCED MEASURE

C16.4 Environmental requirements for plant growth identified with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Discuss the requirements for plant growth (E16.4.1).
2. Have students conduct experiments on plant growth by controlling temperature, moisture, and/or light. Record observations. Use the test results to explain the effects of temperature, moisture, and light on plant growth (E16.4.2, E16.4.3).

SELECTED TOOLS AND MATERIALS

Medium for controlling temperature, moisture, and light.
Plants

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Crop Production, Chapter 6. Metcalf and Elkins.
Plant Growth Factors. Virginia Cooperative Extension Service.

---------------**Application**--------------

DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

16.5 Determine plant nutritive requirements

COURSE

Agricultural Science and Mechanics I (8006)

16.5

PERFORMANCE OBJECTIVE

P16.5 Given a selection of crops to plant, determine their plant nutritive requirements with 85% accuracy.

SELECTED ENABLING OBJECTIVES

E16.5.1 Explain the functions of the three major plant food elements.

E16.5.2 Determine major and minor plant food elements needed by crops.

E16.5.3 Explain the pH scale.

E16.5.4 Determine pH requirements of crops.

E16.5.5 Explain how to raise or lower the pH level of the soil.

E16.5.6 Identify nutrient deficiency symptoms in crops.

E16.5.7 Identify symptoms of excessive amounts of nutrients.

CRITERION-REFERENCED MEASURE

C16.5 Plant nutritive requirements determined with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Discuss the plant food elements using slides and charts (E16.5.1, E16.5.2).
2. Draw and label the pH scale (E16.5.3).
3. Explain the acidity and alkalinity concept and the soil pH relationship to plant nutrition. Determine pH of a given soil. Discuss changing the pH level (E16.5.4, E16.5.5).
4. Discuss nutrient deficiency and overuse. Have students observe and report deficiencies to class (E16.5.6, E16.5.7).

SELECTED TOOLS AND MATERIALS

Soil pH test kit
Plant food elements

SELECTED AUDIOVISUAL MATERIALS

Slides: Life of the Green Plant. NASCO.
Nutrient Deficiency Slide Sets (alfalfa, corn, and soybean). NASCO.
Chart: Nitrogen Cycle Chart. NASCO.
Transparencies: Fertilizers and Lime in Illustrated Horticulture. Virginia Department of Education.

SELECTED REFERENCES

A Handbook of Agronomy. Virginia Cooperative Extension Service.
Horticulture: A Basic Awareness, pp. 21-23. Baudendistel.
Introductory Horticulture, Unit 3. Reily and Shry.

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DUTY AREA	**PROGRAM**
16. GROWING AND REPRODUCING AGRICULTURAL CROPS	AGRICULTURAL SCIENCE AND MECHANICS
TASK/COMPETENCY	**COURSE**
16.6 Determine the amount of plant nutrients to apply	Agricultural Science and Mechanics I (8006)

16.6

PERFORMANCE OBJECTIVE

P16.6 Given access to a field and a crop to be planted, determine the amount of plant nutrients to apply. Recommendation must be within 20% of that recommended by the instructor or extension agent.

SELECTED ENABLING OBJECTIVES

E16.6.1 Set yield goals for the crops.

E16.6.2 Take soil sample.

E16.6.3 Interpret results of soil test.

E16.6.4 Locate general recommendation of nutrients for crops in Handbook of Agronomy.

E16.6.5 Compare recommendation to results of soil test.

E16.6.6 Determine if pH needs to change.

E16.6.7 Determine amount of material to change soil pH to recommended pH.

E16.6.8 Calculate the amount of each nutrient needed.

CRITERION-REFERENCED MEASURE

C16.6 Amount of plant nutrients to apply determined within 20% of instructor's or extension agent's recommendation.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students determine if yield is to be high, medium, or low (E16.6.1).
2. Have students take soil sample, analyze results, and compare to that generally recommended for the crop (E16.6.2-E16.6.5).
3. Discuss changing the soil pH (E16.6.6, E16.6.7).
4. Have students practice calculating the amount of each nutrient needed (E16.6.8).
5. Have students take soil samples, test for essential nutrients, and make recommendations for different crops (E16.6.2-E16.6.6).

SELECTED TOOLS AND MATERIALS

Soil test kit or previous soil sample

SELECTED AUDIOVISUAL MATERIALS

Slides: Fertilizers--A Paying Investment. NASCO.
How to Take a Soil Sample. NASCO.
Transparency: Fertilizer and Lime in Illustrated Horticulture. Virginia Department of Education.

SELECTED REFERENCES

A Handbook of Agronomy. Virginia Cooperative Extension Service.

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DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

16.7 Interpret a fertilizer analysis

COURSE

Agricultural Science and Mechanics I (8006)

16.7

PERFORMANCE OBJECTIVE

P16.7 Given an example of a fertilizer analysis, interpret the analysis with 85% accuracy.

SELECTED ENABLING OBJECTIVES

E16.7.1 Define fertilizer analysis.

E16.7.2 Determine the amount of each nutrient per 100 pounds.

E16.7.3 Give an example of a complete fertilizer.

CRITERION-REFERENCED MEASURE

C16.7 Fertilizer analysis interpreted with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display several samples of fertilizers with different analyses. Discuss the components of the fertilizers (E16.7.1, E16.7.2).
2. Provide several analyses for students to determine the amount of each nutrient (E16.7.2).
3. Have students report on different analyses found locally and indicate if the analyses is complete or incomplete (E16.7.3).

SELECTED TOOLS AND MATERIALS

Fertilizer samples (different analyses)
Interpreting a Fertilizer Analysis (LAP). Virginia Deparment of Education.

SELECTED AUDIOVISUAL MATERIALS

Transparency: Fertilizer and Lime, in Illustrated Horticulture. Virginia Department of Education.

SELECTED REFERENCES

A Handbook of Agronomy. Virginia Cooperative Extension Service.

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DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

16.8 Apply plant nutrients

COURSE

Agricultural Science and Mechanics I (8006)

16.8

PERFORMANCE OBJECTIVE

P16.8 Given access to a field, equipment, nutrients, and information on the rate of application, apply plant nutrients. The nutrients must be applied uniformly and within ± 10% of the recommended rate.

SELECTED ENABLING OBJECTIVES

E16.8.1 Select the type and size of applicator.

E16.8.2 Identify safety practices to follow.

E16.8.3 Set up applicator.

E16.8.4 Calibrate applicator.

E16.8.5 Fill applicator.

E16.8.6 Operate applicator.

CRITERION-REFERENCED MEASURE

C16.8 Plant nutrients applied, uniformly within ± 10% of recommended rate.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display several types of applicators or visit a machinery dealer and discuss the advantages and disadvantages of different types of applicators (E16.8.1).
2. Demonstrate the proper use and operation of the applicator and have students practice (E16.8.1-E16.8.6).
3. Have students bring in types of applicators to use in class (E16.18.1-E16.8.6).

SELECTED TOOLS AND MATERIALS

Fertilizer applicators (drop, broadcast, hand-carried, and wheeled)
Plant nutrients (granular, slow release, liquid, organic, and soluble)
Operator's manuals

SELECTED AUDIOVISUAL MATERIALS

Slides: Accurate Fertilizer Application Means Crop Profits. NASCO.

SELECTED REFERENCES

Farm Machinery and Equipment, Chapter 14. Smith and Wilkes.

DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

TASK/COMPETENCY

16.9 Select seed

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

16.9

PERFORMANCE OBJECTIVE

P16.9 Given plans to plant a crop, select the seed. The seed selected must meet the five characteristics of good quality seed.

SELECTED ENABLING OBJECTIVES

E16.9.1 Identify crop seed.

E16.9.2 Explain the difference between stock seed and foundation seed.

E16.9.3 Explain why seed should be labeled correctly as to type and variety.

E16.9.4 Explain why seed should be free from diseases and insects.

E16.9.5 Explain why seed should be free from dirt, trash, and weed seed.

E16.9.6 Explain why seed should have high viability.

E16.9.7 Explain why seed should be graded.

CRITERION-REFERENCED MEASURE

C16.9 Seed selected that meets the five characteristics of good quality seed.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students complete learning activity packet for Selecting Plant Seed. Allow students who pass the pretest to assist with the judging activities of the class (E16.9.3-E16.9.7).

2. Discuss the characteristics of different seeds. Display samples. Divide the class into teams, and have them compete in identifying seeds (E16.9.1).

3. Have students study the characteristics of good quality seeds. Set up judging classes for the class and use judging score cards. Have students bring seeds from home (E16.9.2-E16.9.7).

SELECTED TOOLS AND MATERIALS

Seeds for identification
Seeds for judging
Seed judging scorecard
Selecting Plant Seed (LAP). Virginia Department of Education

SELECTED AUDIOVISUAL MATERIALS

Slides: Crop Seed Identification. NASCO.

SELECTED REFERENCES

Virginia FFA Activity Handbook, p. 81. Virginia Department of Education.

DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

16.10 Plant crop

COURSE

Agricultural Science and Mechanics I (8006)

16.10

PERFORMANCE OBJECTIVE

P16.10 Given access to a field, equipment, seeds or plants, spacing, and depth, plant crop. Crop must be planted at the spacing and depth recommended by the instructor.

SELECTED ENABLING OBJECTIVES

E16.10.1 Identify types of planters.

E16.10.2 Select the type and size of planter.

E16.10.3 Identify safety practices to follow.

E16.10.4 Prepare planter.

E16.10.5 Load planter.

E16.10.6 Open furrow.

E16.10.7 Set row marker.

E16.10.8 Space seed or plant.

E16.10.9 Cover seed.

E16.10.10 Firm the seed bed.

CRITERION-REFERENCED MEASURE

C16.10 Crop planted at spacing and depth recommended by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display several types of planters, visit a machinery dealer, or have students bring in different types of planters. Discuss the types, sizes, and characteristics (E16.10.1-E16.10.3).

2. Demonstrate the correct use and operation of different types of planters, using the school farm. Have students practice (E16.10.3-E16.10.10).

3. Have students report on the personal use of planters (E16.10.3-E16.10.10).

4. If students have used some planters not normally used in the area, have them report to the class (E16.10.3-E16.10.10).

SELECTED TOOLS AND MATERIALS

Different types of planters
Operator's manuals

SELECTED AUDIOVISUAL MATERIALS

Slides: Planting. Deer and Company.

SELECTED REFERENCES

Planting, Chapter 3. Deere and Company.

DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

TASK/COMPETENCY

16.11 Compare methods of weed control

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

16.11

PERFORMANCE OBJECTIVE

P16.11 Given soil conditions and a crop to be grown, compare methods of weed control. The advantages and disadvantages of each method must include 85% of those listed by the instructor.

SELECTED ENABLING OBJECTIVES

E16.11.1 Describe how weeds get started.

E16.11.2 Identify types of weeds.

E16.11.3 Inventory weed problems.

E16.11.4 Identify types of herbicides.

E16.11.5 Identify equipment needed to apply herbicides.

E16.11.6 Compare the cost of controlling weeds with herbicides versus cultivation.

E16.11.7 Identify crops requiring shallow cultivation.

CRITERION-REFERENCED MEASURE

C16.11 Methods of weed control compared, each method including 85% of the advantages and disadvantages listed by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Conduct a field trip to identify weeds in the area. Discuss their effects on crops (E16.11.1-E16.11.3).

2. Display different types of herbicides and equipment used to apply herbicides. Have students compare the cost at different stores (E16.11.4, E16.11.5).

3. Present the costs of using herbicides and cultivation to control weeds on different crops. Have students compare the costs (E16.11.6).

4. Have students determine the advantages and disadvantages of other methods of weed control (E16.11.6).

5. Have students identify shallow rooted crops (E16.11.7).

SELECTED TOOLS AND MATERIALS

Herbicides
Cultivation equipment
Weeds to identify
Land laboratory

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/cassette: Agricultural Weed Control. NASCO.

SELECTED REFERENCES

Approved Practices in Crop Production, Chapter 17. Brickbauer and Mortensen.

DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

16.12 Describe factors that determine time and frequency of cultivation

COURSE

Agricultural Science and Mechanics I (8006)

16.12

PERFORMANCE OBJECTIVE

P16.12 Given a growing crop, describe factors that determine time and frequency of cultivation with 85% accuracy.

SELECTED ENABLING OBJECTIVES

E16.12.1 Distinguish different soil conditions.

E16.12.2 Compare the effects of cultivation at different stages of growth.

E16.12.3 Compare the effects of cultivation during different moisture conditions.

E16.12.4 Inventory for the presence of weeds.

E16.12.5 Compare the effects of different types of cultivators.

CRITERION-REFERENCED MEASURE

C16.12 Factors that determine time and frequency of cultivation described with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students observe and discuss different soil conditions (E16.12.1).
2. Have students experiment on the effects of cultivation at different stages of growth and moisture conditions (E16.12.2-E16.12.4).
3. Have students observe and compare the effects of different types of cultivators (E16.12.5).
4. Have students keep records on the number of times different crops are cultivated (E16.12.1-E16.12.5).

SELECTED TOOLS AND MATERIALS

Cultivation equipment
Land laboratory

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Tillage Alternatives. NASCO.

SELECTED REFERENCES

Approved Practices in Crop Production. Brickbauer and Mortensen.

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DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

16.13 Identify types of cultivation equipment

COURSE

Agricultural Science and Mechanics I (8006)

16.13

PERFORMANCE OBJECTIVE

P16.13 Given a selection of cultivation equipment, identify types of cultivation equipment with 85% accuracy on a written or oral test.

SELECTED ENABLING OBJECTIVES

E16.13.1 Identify parts of cultivation equipment.

E16.13.2 Describe the functions of the parts of cultivation equipment.

E16.13.3 Identify the crops for which cultivation equipment is used.

CRITERION-REFERENCED MEASURE

C16.13 Types of cultivation equipment identified with 85% accuracy on a written or oral test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students who have used cultivation equipment explain to other students how it operates (E16.13.1-E16.13.3).
2. Have students bring in pictures of cultivation equipment (E16.13.1-E16.13.3).
3. Have students report on cultivation equipment used in their supervised occupational experience programs (E16.13.1-E16.13.3).

SELECTED TOOLS AND MATERIALS

Cultivation equipment
Equipment brochures

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Tillage, Chapter 17. Deere and Company.

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DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

16.14 Identify ways to procure equipment

COURSE

Agricultural Science and Mechanics I (8006)

16.14

PERFORMANCE OBJECTIVE

P16.14 Given a simulated situation or a supervised work experience program requiring equipment, identify ways to procure equipment. The three methods--purchase, rent, and custom-hire-- must be identified.

SELECTED ENABLING OBJECTIVES

E16.14.1 Identify equipment.

E16.14.2 Determine the cost of purchasing equipment.

E16.14.3 Determine the cost of renting equipment.

E16.14.4 Determine the cost of custom-hiring equipment.

E16.14.5 List advantages and disadvantages of owning, renting, and custom-hiring the use of equipment.

CRITERION-REFERENCED MEASURE

C16.14 Ways to procure equipment, including purchase, rent and custom-hire, identified.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display pictures of equipment for students to identify (E16.14.1).
2. Have students determine the purchase, rental, and custom-hire cost of equipment by visiting a machinery dealership, talking to farmers, or using the telephone (E16.14.2-E16.14.4).
3. Have students interview farmers to determine the advantages and disadvantages of owning, renting, and custom-hiring the use of equipment (E16.14.5).

SELECTED TOOLS AND MATERIALS

Pictures of equipment

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Machinery Management, Chapter 13. Deere and Company.

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DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

16.15 Cultivate crops

COURSE

Agricultural Science and Mechanics I (8006)

16.15

PERFORMANCE OBJECTIVE

P16.15 Given a growing crop and the necessary equipment, cultivate the crop so that grass and weeds are uprooted or covered with soil. The crop must not be damaged. The soil must be broken to a depth recommended for crop and weather conditions.

SELECTED ENABLING OBJECTIVES

E16.15.1 Identify types of cultivators.

E16.15.2 Select the type and size of planter.

E16.15.3 Identify safety practices to follow.

E16.15.4 Attach cultivator to tractor.

E16.15.5 Determine depth to break the soil.

E16.15.6 Adjust cultivator angle.

E16.15.7 Adjust cultivator depth.

E16.15.8 Use cultivator.

E16.15.9 Lubricate cultivator.

CRITERION-REFERENCED MEASURE

C16.5 Crop cultivated, grass and weeds uprooted or covered with soil without damaging crop, soil broken to depth recommended for crop and weather conditions.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display pictures of cultivators used in the area or show slides of cultivators. Discuss the types, sizes, and characteristics (E16.15.1-E16.15.3).
2. Demonstrate the correct use and operation of different types of cultivators, using the school farm. Have students practice (E16.15.3-E16.15.9).
3. Have students report on cultivators they have used (E16.15.1-E16.15.9).

SELECTED TOOLS AND MATERIALS

Cultivators
Pictures of cultivators
Tractor
Operator's manual

SELECTED AUDIOVISUAL MATERIALS

Slides: Tillage. Deere and Company.

SELECTED REFERENCES

Tillage, Chapter 17. Deere and Company.

DUTY AREA

16. GROWING AND REPRODUCING AGRICULTURAL CROPS

TASK/COMPETENCY

16.16 Clean and store equipment

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

16.16

PERFORMANCE OBJECTIVE

P16.16 Given the necessary equipment and supplies, clean and store equipment. Equipment must be clean, spots repainted neatly, lubricated according to specifications, and stored inside on boards, if possible.

SELECTED ENABLING OBJECTIVES

E16.16.1 Remove trash, soil, and grease.

E16.16.2 Repaint spots where paint is scratched or worn.

E16.16.3 Coat soil-engaging tools with grease or plowbottom paint.

E16.16.4 Lubricate equipment.

E16.16.5 Store inside on boards, if possible.

CRITERION-REFERENCED MEASURE

C16.16 Equipment cleaned and stored, spots repainted neatly, equipment lubricated according to specifications, and stored inside on boards, if possible.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students use operator's manual to determine proper cleaning, lubricating, and storing procedures (E16.16.1-E16.16.5).

2. Visit students' supervised occupational experience programs, and inspect to see that equipment is cleaned and stored properly (E16.16.1-E16.16.5).

SELECTED TOOLS AND MATERIALS

Hot water
Detergent
Grease remover
Lubricant
Operator's manuals
Grease
Paint

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Planting. Deere and Company.
Tillage. Deere and Company.

DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

TASKS/COMPETENCIES

17.1 Plan a home vegetable garden

17.2 Prepare a seedbed for a home vegetable garden

17.3 Apply nutrients to home vegetable gardens, based on soil test

17.4 Plant a home vegetable garden

17.5 Cultivate a home vegetable garden

17.6 Control insects and pests in a home vegetable garden

17.7 Harvest crops from a home vegetable garden

17.8 Develop a plan for maintaining the homestead

17.9 Develop a plan for winterizing the home

17.10 Design a basic landscape plan for the home

17.11 Select appropriate landscape materials for the rural or urban home

17.12 Plant landscaping materials

17.13 Prune and care for a landscaped area

17.14 Establish a lawn

17.15 Care for and maintain a lawn

Planning note: The instructor may wish to treat tasks 17.2 and 17.5 as review exercises, since similar tasks (16.3 and 16.15) are covered in the previous Duty Area.

DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

TASK/COMPETENCY

17.1 Plan a home vegetable garden

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

17.1

PERFORMANCE OBJECTIVE

P17.1 Given access to a home in need of a vegetable garden, plan a home vegetable garden. All components on an instructor-prepared checklist must be rated acceptable.

SELECTED ENABLING OBJECTIVES

E17.1.1 Evaluate family vegetable interests and needs.

E17.1.2 Select vegetables to be grown.

E17.1.3 Determine size of garden needed.

E17.1.4 Determine location of garden.

E17.1.5 Outline shape of garden.

E17.1.6 Determine location of different vegetables.

E17.1.7 Plan spacing for plants and direction of rows.

E17.1.8 Plan successive plantings.

E17.1.9 Determine quantity of seed.

E17.1.10 Determine planting dates.

E17.1.11 Select seed source.

CRITERION-REFERENCED MEASURE

C17.1 Home vegetable garden planned, all components on instructor's checklist rated acceptable.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students survey and summarize the family needs and determine the varieties that can be successfully grown in the area. Use charts to determine the space needed for each vegetable (E17.1.1-E17.17.1.3).
2. Discuss factors to consider in determining location (E17.1.4).
3. Demonstrate the proper use of graph paper and have students use graph paper to determine shape, location of vegetables, spacing, direction of rows, and location of successive plantings (E17.1.5-E17.1.8).
4. Refer to charts to determine quantity of seed needed and planting dates (E17.1.9, E17.1.10).
5. Discuss factors to consider in selecting seed source. Visit seed distributors (E17.1.11).

SELECTED TOOLS AND MATERIALS

Instructor-prepared checklist
Graph paper
Seed catalogs
Ruler

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Guide For the Beginning Gardner. Virginia Cooperative Extension Service.
Introductory Horticulture, Units 37-38. Reily and Shry.
Planning and Locating the Garden, MH 312. Virginia Cooperative Extension Service.
Selecting Plant Seed (LAP). Virginia Department of Education.
Vegetable Seed Handbook. Southern States Cooperative, Inc.

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DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

17.2 Prepare a seedbed for a home vegetable garden

COURSE

Agricultural Science and Mechanics I (8006)

17.2

PERFORMANCE OBJECTIVE

P17.2 Given a plot of land and the necessary equipment, prepare a seedbed for a home vegetable garden. Seedbed must be free of clods and clumps, level, loose, and moist.

SELECTED ENABLING OBJECTIVES

E17.2.1 Apply crop residue, manure, leaves, etc.

E17.2.2 Break land with plow or tiller.

E17.2.3 Disk or harrow land.

E17.2.4 Demonstrate safety in plowing, tilling, disking, and harrowing.

CRITERION-REFERENCED MEASURE

C17.2 Seedbed for a home vegetable garden prepared, bed free of clods and clumps, level, loose, and moist.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Discuss the benefits of adding crop residue, manure, leaves, grass clippings, etc. (E17.2.1).

2. Have students practice using a plow, tiller, disk, and harrow (E17.2.2, E17.2.3).

3. Have students complete a safety and operating procedure test prior to using tractor and equipment (E17.2.2-E17.2.4).

SELECTED TOOLS AND MATERIALS

Tractor
Tiller
Plow
Disk
Harrow

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Crop Production, Vegetable Grower, pp. 74-79. V-TECS.
Guide for the Beginning Gardener. Virginia Cooperative Extension Service.
Selecting Garden Equipment. Virginia Cooperative Extension Service.
Soil Preparation. Virginia Cooperative Extension Service.
Vegetable Seed Handbook. Southern States Cooperative, Inc.

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DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

17.3 Apply nutrients to home vegetable garden, based on soil test

COURSE

Agricultural Science and Mechanics I (8006)

17.3

PERFORMANCE OBJECTIVE

P17.3 Given a vegetable garden, nutrients, and the necessary equipment, apply nutrients to home vegetable garden, based on soil test. Nutrients must be applied uniformly and according to soil test recommendations.

SELECTED ENABLING OBJECTIVES

E17.3.1 Describe the functions of essential plant food elements.

E17.3.2 List the various forms of nutrients.

E17.3.3 Select type and size of distributor.

E17.3.4 Load distributor.

E17.3.5 Adjust distributor.

E17.3.6 Calibrate distributor.

E17.3.7 Apply nutrients before planting.

E17.3.8 Mix nutrients into soil.

E17.3.9 Apply nutrients after emergence of plants.

E17.3.10 Wash and clean distributor.

CRITERION-REFERENCED MEASURE

C17.3 Nutrients applied uniformly to home vegetable garden, based on soil test and soil test recommendations.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display samples of nutrients and discuss the functions of each (E17.3.1, E17.3.2).
2. Tour a local fertilizer plant (E17.3.1, E17.3.2).
3. Conduct an experiment applying various plant food elements (E17.3.1, E17.3.2).
4. Demonstrate types of distributors used in the area and have students practice (E17.3.3-E17.3.8).
5. Have students apply nutrients to home gardens (E17.3.3-E17.3.8).
6. Have students wash, clean, and oil distributor (E17.3.10).

SELECTED TOOLS AND MATERIALS

Fertilizer samples (granular, slow release, liquid, organic, and soluble)
Fertilizer distributors (various)
Soil test specifications

SELECTED AUDIOVISUAL MATERIALS

Transparency masters: Fertilizer and pH Sections in Illustrated Horticulture. Virginia Department of Education.
Filmstrip/cassette: Identifying Fertilizer Ingredients. Singer.

SELECTED REFERENCES

Crop Production, Vegetable Grower, pp. 96-99. V-TECS.
Fertilizing Your Garden. Virginia Cooperative Extension Service.
Vegetable Seed Handbook. Southern States Cooperative, Inc.

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DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

17.4 Plant a home vegetable garden

COURSE

Agricultural Science and Mechanics I (8006)

17.4

PERFORMANCE OBJECTIVE

P17.4 Given a prepared seed bed and the necessary equipment, seeds, and plants, plant a home vegetable garden. All components on an instructor-prepared checklist must be rated acceptable.

SELECTED ENABLING OBJECTIVES

E17.4.1	Demonstrate the use of garden tools.
E17.4.2	Lay off rows.
E17.4.3	Use planter.
E17.4.4	Plant seeds by hand.
E17.4.5	Transplant by hand.
E17.4.6	Use transplanter.
E17.4.7	Water seedlings.
E17.4.8	Cover seeds.
E17.4.9	Firm soil around seedlings.

CRITERION-REFERENCED MEASURE

C17.4 Home vegetable garden planted, all items on an instructor-prepared checklist rated acceptable.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the proper use of garden tools (E17.4.1, E17.4.2, E17.4.8, E17.4.9).
2. Demonstrate the use and adjustment of mechanical planter (E17.4.3).
3. Demonstrate planting by hand (E17.4.4).
4. Demonstrate how to transplant by hand, water, and firm soil around seedlings (E17.4.5, E17.4.7).
5. Demonstrate the use and adjustment of transplanter (E17.4.6).
6. Have students practice all above activities (E17.4.1-E17.4.9).
7. Have students report on methods used at home to plant a vegetable garden (E17.4.1-E17.4.9).
8. Have students without home gardens prepare a coldframe (E17.4.1-E17.4.9).

SELECTED TOOLS AND MATERIALS

Garden rake
Hoe
Cord
Wheelbarrow
Water
Seeds
Transplants
Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/cassette: Planting. Teaching Aid.

SELECTED REFERENCES

Crop Production--Vegetable Grower, pp. 83-85, 87-88. V-TECS.
Introductory Horticulture, Unit 38. Reily and Shry.
Vegetable Planting Guide. Virginia Cooperative Extension Service.
Vegetable Seed Handbook. Southern States Cooperative, Inc.

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DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

17.5 Cultivate a home vegetable garden

COURSE

Agricultural Science and Mechanics I (8006)

17.5

PERFORMANCE OBJECTIVE

P17.5 Given a home garden and the necessary equipment, cultivate a home vegetable garden. The grass and weeds must be uprooted or covered with soil. The vegetable plants must not be damaged. The soil must be broken to a depth recommended for crop and weather conditions.

SELECTED ENABLING OBJECTIVES

E17.5.1 Determine correct soil conditions to cultivate.

E17.5.2 Determine depth to cultivate.

E17.5.3 Identify equipment used to cultivate a garden.

E17.5.4 Identify safety practices to follow.

E17.5.5 Use hand tools.

E17.5.6 Use tractor cultivator.

E17.5.7 Adjust cultivator.

CRITERION-REFERENCED MEASURE

C17.5 Home vegetable garden cultivated, grass and weeds uprooted or covered with soil without damaging vegetable plant, soil broken to depth recommended for crop and weather conditions.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students experiment cultivating under differing soil conditions, and observe the results (E17.5.1).
2. Determine which vegetables have shallow roots (E17.5.2).
3. Have students report on the different methods and equipment used to cultivate a garden (E17.5.3).
4. Have students practice cultivating with different types of equipment (E17.5.4-E17.5.7).
5. Visit students who have home gardens to observe if they are cultivating correctly (E17.5.1-E17.5.7).

SELECTED TOOLS AND MATERIALS

Cultivators
Rakes
Hoes
Tractor
Operator's manuals

SELECTED AUDIOVISUAL MATERIALS

Slides: Tillage. Deere and Company.

SELECTED REFERENCES

Introductory Horticulture, Unit 39. Reily and Shry.

DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

TASK/COMPETENCY

17.6 Control insects and pests in a home vegetable garden

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

17.6

PERFORMANCE OBJECTIVE

P17.6 Given a home garden and the necessary supplies and equipment, control insects and pests in a home vegetable garden. The correct insecticide must be applied uniformly and at the recommended rate.

SELECTED ENABLING OBJECTIVES

E17.6.1 Identify insects.

E17.6.2 Select insecticides.

E17.6.3 Select methods of application.

E17.6.4 List and follow safety precautions.

E17.6.5 Mix insecticides.

E17.6.6 Dust vegetable.

E17.6.7 Spray vegetables.

E17.6.8 Calibrate and adjust applicator.

E17.6.9 Clean equipment.

E17.6.10 Dispose of containers.

CRITERION-REFERENCED MEASURE

C17.6 Insects and pests in a home vegetable garden controlled, correct insecticide used and applied uniformly at recommended rate.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students bring in insect collections or pictures of insects for identification. Discuss the characteristics of common insects (E17.6.1).
2. Display insecticide labels, and have students select the correct insecticide for given insects (E17.6.2).
3. Have students read and discuss safety precautions to follow when applying insecticides (E17.6.3, E17.6.4).
4. Have students practice applying insecticides using substitutes: flour or meal for dust and water for liquid (E17.6.5-E17.6.8).
5. Have students apply insecticides to their home gardens (E17.6.5-E17.6.8).
6. How students clean equipment thoroughly and dispose of containers as prescribed by the Environmental Protection Agency (E17.6.9, E17.6.10).

SELECTED TOOLS AND MATERIALS

Protective equipment
Dusting equipment
Spraying equipment
Insecticide labels
Mixing containers
Substitutes for insecticides

SELECTED AUDIOVISUAL MATERIALS

Slides: Select from list available from Virginia Cooperative Extension Service.
Slides/cassettes: Applying Pesticides. AAVIM.

SELECTED REFERENCES

Applying Pesticides, Part I. AAVIM.
Introductory Horticulture, Unit 19. Reily and Shry.
Vegetable Garden Handbook. Southern States Cooperative Inc.
Virginia Pest Control Guide. Virginia Cooperative Extension Service.

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DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

17.7 Harvest crops from a home vegetable garden

COURSE

Agricultural Science and Mechanics I (8006)

17.7

PERFORMANCE OBJECTIVE

P17.7 Given a home vegetable garden and the necessary equipment, harvest crops from a home vegetable garden. Vegetables must not show damage and must be harvested at peak of quality.

SELECTED ENABLING OBJECTIVES

E17.7.1 Describe the condition of vegetables when at peak of quality.

E17.7.2 Assemble equipment for harvesting.

E17.7.3 Describe methods of harvest.

E17.7.4 Describe how to harvest vegetables without causing damage.

E17.7.5 Harvest vegetables.

E17.7.6 Store vegetables.

CRITERION-REFERENCED MEASURE

C17.7 Crops harvested from a home vegetable garden without damage and at peak of quality.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Visit a farmer market or super market to identify the characteristics of vegetables at the peak of quality (E17.7.1).
2. Have students inspect and repair equipment and containers used to harvest vegetables (E17.7.2-E17.7.6).
3. Have students name vegetables that are pulled, picked, and/or dug (E17.7.3).
4. Have students describe methods used to harvest vegetables that are less likely to damage the plant or vegetable (E17.7.4).
5. Have students harvest and store vegetables from their home gardens or school garden and assist their neighbors (E17.7.5, E17.7.6).

SELECTED TOOLS AND MATERIALS

Pictures of vegetables
Actual vegetables, if available
Harvesting equipment
Baskets
Buckets

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Guide for the Beginning Gardener. Virginia Cooperative Extension Service.
Horticulture: A Basic Awareness, Chapter 20. Baudendistel.
Vegetable Seed Handbook. Southern States Cooperative, Inc.

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DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

17.8 Develop a plan for maintaining the homestead

COURSE

Agricultural Science and Mechanics I (8006)

17.8

PERFORMANCE OBJECTIVE

P17.8 Given access to a homestead with buildings, machinery, and equipment, develop a plan for maintaining the homestead. The plan must be rated acceptable according to an instructor-prepared checklist.

SELECTED ENABLING OBJECTIVES

E17.8.1 List the purposes of an inventory.

E17.8.2 Inventory buildings, machinery, and equipment.

E17.8.3 Schedule and record repair and maintenance of buildings, machinery, and equipment.

E17.8.4 Identify hazards that may cause fire or injury.

CRITERION-REFERENCED MEASURE

C17.8 Plan for maintaining the homestead developed, all parts of the plan rated acceptable according to instructor-prepared checklist.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Assign students the task of determining the purposes of an inventory prior to teaching the unit (E17.8.1).

2. Review existing inventory forms. Have students inventory local situation or local farm to include identification information and market value (E17.8.2).

3. Have students develop a home filing system for operator's and service manuals, schedule for periodic maintenance for each, and record type of maintenance, time required, cost, and date (E17.8.3).

4. Develop this competency using the FFA Safety Program (E17.8.4).

5. Have students use or set up an inventory on a computer program (E17.8.2, E17.8.3).

6. Record in student record book (E17.8.2, E17.8.3).

SELECTED TOOLS AND MATERIALS

Instructor-prepared checklist
Inventory forms
Schedule forms (maintenance)
Computer inventory programs

SELECTED AUDIOVISUAL MATERIALS

Computer software: Easy Inventory. AAVIM.

SELECTED REFERENCES

Doane's Farm Management Guide. Doane Agricultural Service.
Farm Business Manager, pp. 85-86, 103-104. V-TECS.

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DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

17.9 Develop a plan for winterizing the home

COURSE

Agricultural Science and Mechanics I (8006)

17.9

PERFORMANCE OBJECTIVE

P17.9 Given access to a home needing insulation, develop a plan for winterizing the home. The plan must be rated acceptable according to an instructor-prepared checklist.

SELECTED ENABLING OBJECTIVES

E17.9.1 List the advantages of winterizing the home.

E17.9.2 Identify type of weatherstripping, caulking, and insulation.

E17.9.3 Determine where winterizing is needed.

E17.9.4 Identify where aluminum thresholds are needed.

E17.9.5 Locate other energy saving needs at home.

CRITERION-REFERENCED MEASURE

C17.9 Plan for winterizing the home developed, all items on instructor-prepared checklist rated acceptable.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students report on the advantages of winterizing the home (E17.9.1).
2. Display types of winterizing materials and discuss their uses (E17.9.2).
3. Have students survey the home to determine means of saving energy. Have them estimate the quantity of materials needed (E17.9.3-E17.9.5).

Note: This unit could lead into an analysis of farm energy, using the U.S. Department of Energy publications.

SELECTED TOOLS AND MATERIALS

Instructor-prepared checklist
Water heating checklist (National Food and Energy Council)
Insulation checklist (National Food and Energy Council)

SELECTED AUDIOVISUAL MATERIALS

Transparency masters:	Places Where Caulking May be Needed, p. 50, Providing for Energy Efficiency in Homes and Small Buildings, Teacher Guide. U. S. Department of Energy.

SELECTED REFERENCES

Energy Conservation in the Rural Home (EMS 863). Virginia Cooperative Extension Service.
Farm Energy Analysis. National Food and Energy Council.
Providing for Energy Efficiency in Homes and Small Buildings, Part III, (DOE/IR/0610651-1 Pt. 3). U. S. Department of Energy.

DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

TASK/COMPETENCY

17.10 Design a basic landscape plan for the home

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

17.10

PERFORMANCE OBJECTIVE

P17.10 Given a rural or urban home setting, design a basic landscape plan showing the location of trees, shrubs, flower beds, and other features by completing an instructor-prepared worksheet according to instructions.

SELECTED ENABLING OBJECTIVES

E17.10.1 Match terms associated with landscaping to the correct definitions.

E17.10.2 Identify the three major areas in a landscape plan.

E17.10.3 List three overall objectives of a landscape plan.

E17.10.4 List three rules of thumb to follow in drawing a landscape plan.

E17.10.5 Identify symbols used in landscape designs.

E17.10.6 Collect and identify ten samples of trees and shrubs used in the local community.

CRITERION-REFERENCED MEASURE

C17.10 Basic landscape plan designed, trees, shrubs, flower beds and other features located by completing instructor-prepared worksheet according to instructions.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display examples of landscape drawings. Discuss the major areas and objectives of a landscape plan (E17.10.1-E17.10.4).
2. Review Duty Area 5. Use LAP to identify plant symbols (E17.10.5).
3. Have students bring in pictures of their home area to compare the landscaping needed or used (E17.10.6).

SELECTED TOOLS AND MATERIALS

Sample landscape plans (Landscaping, Unit 7)
Pencil and paper
Landscape area
Instructor-prepared worksheet

SELECTED AUDIOVISUAL MATERIALS

Transparencies:

Major Areas of Landscape Plan in Vocational Agriculture Education II. Oklahoma State Board of Vocational and Technical Education.
Basic Landscaping Symbols in Vocational Agriculture Education II. Oklahoma State Board of Vocational and Technical Education.
Landscape Design (95 masters) in Illustrated Horticulture. Virginia Department of Education.

SELECTED REFERENCES

The Beginning of a Landscape Plan. Virginia Cooperative Extension Service.
Identifying Plant Symbols Used in Landscape Designs (LAP). Virginia Department of Education.
Illustrated Horticulture. Virginia Department of Education.
Landscaping. Ingels.
Vocational Agriculture Education II, pp 219D - 242D. Oklahoma State Board of Vocational and Technical Education.

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DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

17.11 Select appropriate landscape materials for the rural or urban home

COURSE

Agricultural Science and Mechanics II (8008)

17.11

PERFORMANCE OBJECTIVE

P17.11 Given a rural or urban home setting, select appropriate landscape materials that meet guidelines provided by the instructor. Score 85% on a written test.

SELECTED ENABLING OBJECTIVES

E17.11.1	Identify trees, shrubs, and plants used in landscapes in the local community.
E17.11.2	Locate a source of factors to consider in selecting materials for landscapes.
E17.11.3	List three overall objectives of a landscape plan.
E17.11.4	List factors to consider when selecting trees for a landscape plan.
E17.11.5	List factors to consider when selecting shrubs for a landscape plan.
E17.11.6	List factors to consider when selecting plants for a landscape plan.

CRITERION-REFERENCED MEASURE

C17.11 Appropriate landscape materials selected, meeting guidelines provided by the instructor, score of 85% on a written test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Visit a landscaped area, and discuss the characteristics of materials used and how they fit into the objectives of a landscape plan (E17.11.1, E17.11.3-E17.11.6).
2. Have students use references to locate sources of factors to consider in selecting materials (E17.11.2).
3. Have a specialist talk to the class about factors to consider in selecting materials for landscaping (E17.11.4-E17.11.6).
4. Have students identify actual trees, shrubs, and plants used for landscaping in the local community (E17.11.1).

SELECTED TOOLS AND MATERIALS

List of landscaped areas suitable to visit
List of specialists available to speak to the class
Assignment sheet #1, Collecting and Identifying Trees and Shrubs, in Vocational Agriculture Education II, Oklahoma State Board of Vocational and Technical Education.

SELECTED AUDIOVISUAL MATERIALS

Filmstrips: Selecting Trees for Landscape Use. NASCO.
Selecting and Arranging Trees and Shrubs. NASCO.

SELECTED REFERENCES

Introductory Horticulture, Section 9. Reily and Shry.
Landscaping. Ingels.
Vocational Agriculture Education II, p. 233D. Oklahoma State Board of Vocational and Technical Education.

DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

TASK/COMPETENCY

17.12 Plant landscaping materials

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

17.12

PERFORMANCE OBJECTIVE

P17.12 Given landscaping materials and the necessary tools, equipment, and supplies, plant landscaping materials. All items included on the instructor checklist must be rated acceptable.

SELECTED ENABLING OBJECTIVES

E17.12.1 Identify landscaping materials used in the local community.

E17.12.2 Select appropriate trees, shrubs, and plants.

E17.12.3 Identify desirable features of stock.

E17.12.4 Prepare stock for planting.

E17.12.5 Select the area to plant.

E17.12.6 Prepare the area for planting.

E17.12.7 Explain the proper methods for planting landscape materials.

E17.12.8 Provide support for stock if necessary.

CRITERION-REFERENCED MEASURE

C17.12 Landscaping materials planted, all items on checklist rated acceptable.

INSTRUCTOR CHECKLIST: 17.12

DUTY: Living in Rural and Urban Areas

TASK: Plant landscaping materials

ACTIVITY: Plant trees and shrubs

ITEM	RATING*	
	Acceptable	Unacceptable
1. Tools, equipment, and materials were properly selected and used.		
2. Holes were dug in designated areas to accommodate the requirements of the particular shrub or tree to be planted in a particular hole.		
3. Soil amendments and plant food were placed in the hole and carefully mixed before the planting was done.		
4. Trees and/or shrubs were set in holes before final placement in order to check depth of planting and necessary adjustment were made in depth and size of hole.		
5. Trees and shrubs were planted at proper depth.		
6. Holes were backfilled and water was applied in the process to prevent air pocketing.		
7. Stakes and/or guide wires were attached to trees when this was necessary to secure desired stability.		
8. Trunks were protected to avoid guide wire damage.		
9. Additional water was applied in a basined area around the plant to provide a reserve of moisture and to insure good moisture penetration.		
10. Post-planting attention was continued to ensure establishment.		

*All activities should be performed acceptably.

Source: Turfgrass Maintenance Worker. V-TECS.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Visit a landscaped area, identify desirable and undesirable features of materials, and discuss the appropriateness of items used (E17.12.1-E17.12.3).

2. Have students assist in planting landscape materials, and provide close supervision. As students develop skills, have them supervise a small group (E17.12.4, E17.12.5).

3. Have students improve their home grounds and community by planting trees, shrubs, and plants (E17.12.4-E17.12.8).

SELECTED TOOLS AND MATERIALS

Instructor checklist
Stakes
Wire
Twine
Water
Mulch
Fertilizer

SELECTED AUDIOVISUAL MATERIALS

Transparencies:

Size Tree to Plant
Transplanting the Tree.
Time to Transplant Trees.
Preparing Stocks to Plant.
Setting Deciduous Trees.
Time to Transplant Shrubs.
Planting Ground Cover.

(All transparencies in Illustrated Horticulture. Virginia Department of Education.)

SELECTED REFERENCES

Introductory Horticulture, Section 9. Reily and Shry.
Landscaping, Section 3. Ingels.
Turfgrass Maintenance Worker, pp. 52-53, Objective 37. V-TECS.

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DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

17.13 Prune and care for a landscaped area

COURSE

Agricultural Science and Mechanics II (8008)

17.13

PERFORMANCE OBJECTIVE

E17.13 Given the necessary tools, equipment, supplies, and materials, prune and care for a landscaped area. All items on instructor checklist must be rated acceptable.

SELECTED ENABLING OBJECTIVES

E17.13.1 List reasons for pruning.

E17.13.2 Identify the parts of trees and shrubs which are important to consider when pruning.

E17.13.3 Identify limbs or branches to be removed.

E17.13.4 Identify pruning equipment.

E17.13.5 Describe pruning techniques for various trees and shrubs.

E17.13.6 Describe procedures for removing branches and limbs of trees and shrubs.

E17.13.7 Demonstrate safety in pruning.

E17.13.8 Clean ground of leaves and litter.

E17.13.9 Mulch plants.

E17.13.10 Weed landscape beds.

CRITERION-REFERENCED MEASURE

C17.13 Landscaped area pruned and cared for, all items on instructor checklist rated acceptable.

INSTRUCTOR CHECKLIST: 17.13

DUTY: Living in Rural and Urban Areas

TASK: Prune and care for a landscaped area

ACTIVITY: Prune trees and shrubs

ITEM	RATING*	
	Acceptable	Unacceptable
1. Tools selected and used for pruning each tree and shrub were suitable.		
2. All dead and damaged branches were removed.		
3. A sufficient number of live limbs and branches were removed to permit an adequate amount of sunlight to penetrate the foliage and give the tree or shrub a desirable shape, appearance and aesthetic balance.		
4. Limbs and branches cut out were selected with care.		
5. Tools were properly used and cared for in such a way as to not to dull their cutting edge unnecessarily or damage the trees and shrubs being pruned.		
6. Sufficient care was taken to avoid bruising limbs and branches and pruning paint was applied to surfaces where large limbs had been severed.		
7. Tools were cleaned and returned to their proper place when the work was completed.		

* All activities should be performed acceptably.

Source: Turfgrass Maintenance Worker. V-TECS.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Visit a landscaped area in need of pruning. Discuss the reasons for pruning. Demonstrate the proper techniques and objectives and allow students to prune under close supervision (E17.13.1-E17.13.7).

2. Have students bring in various branches of trees and shrubs to practice the proper cutting techniques (E17.13.2-E17.13.7).

3. Demonstrate the proper use of tools (E17.13.7, E17.13.8).

4. Have students prune shrubs, mulch plants, and weed landscape beds on school grounds under close supervision (E17.13.2-E17.13.10).

SELECTED TOOLS AND MATERIALS

Pruning equipment
Instructor checklist

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/cassette: Elements of Pruning. Vocational Education.

Transparencies: Planting and Maintenance, in Illustrated Horticulture. Virginia Department of Education.

SELECTED REFERENCES

Illustrated Horticulture, Planting and Maintenance. Virginia Department of Education.
Introductory Horticulture, Unit 32. Reily and Shry.
Landscaping, Unit 25. Ingels.

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DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

17.14 Establish a lawn

COURSE

Agricultural Science and Mechanics II (8008)

17.14

PERFORMANCE OBJECTIVE

P17.14 Given a grass lawn area and the necessary tools, equipment, and materials establish a lawn. All items on instructor checklists must be rated acceptable.

SELECTED ENABLING OBJECTIVES

E17.14.1 Prepare the site.

E17.14.2 Take soil sample.

E17.14.3 Select fertilizer and lime.

E17.14.4 Apply fertilizer and lime.

E17.14.5 Select seed.

E17.14.6 Seed lawn.

E17.14.7 Firm soil.

E17.14.8 Mulch lawn.

CRITERION-REFERENCED MEASURE

C17.14 Lawn established, all items on instructor checklists rated acceptable.

INSTRUCTOR CHECKLIST: 17.14A

DUTY: Living in Rural and Urban Areas

TASK: Establish a lawn

ACTIVITY: Plow and/or disk

ITEM	RATING*	
	Acceptable	Unacceptable
1. Tractor and equipment assigned was properly serviced prior to use.		
2. Plow and/or disk were properly leveled and adjusted for doing the best possible job.		
3. Pattern followed was suitable considering the size of the field, its shape, slope and all other relevant factors.		
4. Depth of cut met specifications and no areas were left uncut or less level than they were when the operation started.		
5. Care was taken to follow all necessary safety precautions.		
6. Equipment was adequately cleaned and serviced following use and prior to storage.		

* All activities should be performed acceptably.

Source: Turfgrass Maintenance Worker. V-TECS.

INSTRUCTOR CHECKLIST: 17.14B

DUTY: Living in Rural and Urban Areas

TASK: Establish a lawn

ACTIVITY: Plant grass seed.

ITEM	RATING*	
	Acceptable	Unacceptable
1. Condition of area to be seeded was determined prior to selection of seeder and other equipment.		
2. The selection of seeder and other equipment was based on field conditions as determined and were suitable.		
3. Tractor and other equipment selected for use was adequately serviced and its performance checked prior to use.		
4. Seeder was calibrated to deliver the prescribed amount of seed per acre.		
5. Seed was planted at proper depth and was evenly and uniformly distributed over entire area.		
6. Fertilizer, if not previously added and mixed into soil was applied at the same time or immediately following seeding.		
7. Seed, if not drilled into the soil, was covered at the appropriate depth by means of a very light disking, brush drag or other suitable means.		
8. All tools and equipment used were well cleaned following use and returned to their proper place in the storage area.		

* All activities should be performed acceptably.

Source: Turfgrass Maintenance Worker. V-TECS.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students prepare small plots of various lawn grasses. Level the area with a rake. Have students observe all safety precautions (E17.14.1).
2. Refer to Performance Objective 15.8 on taking a soil sample (E17.14.2).
3. Have students practice using a fertilizer spreader and a seed spreader to obtain uniform coverage. Substitute sand and apply to a marked area of a parking lot (E17.14.3-E17.14.6).
4. Create a display showing labeled samples of lawn seed (E17.14.5)
5. Invite a local landscape contractor to discuss various techniques of establishing a new lawn (E17.14.1-E17.14.8).
6. Have students firm the seedbed and apply mulch (E17.14.7, E17.14.8).
7. Have students establish a lawn at home as part of their supervised occupational experience program (E17.14.1-E17.14.8).

SELECTED TOOLS AND MATERIALS

Rotary tiller
Fertilizer spreader
Lime spreader
Instructor checklists
Seed spreader
Rakes
Wheelbarrow
Seed
Roller
Mulch (straw)

SELECTED AUDIOVISUAL MATERIALS

Transparency: Landscape Planting and Bed Preparation. NASCO.

SELECTED REFERENCES

Introductory Horticulture, Unit 34. Reily and Shry.
Working in Horticulture, Chapter 18. Richardson and Moore.

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DUTY AREA

17. LIVING IN RURAL AND URBAN AREAS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

17.15 Care for and maintain a lawn

COURSE

Agricultural Science and Mechanics II (8008)

17.15

PERFORMANCE OBJECTIVE

P17.15 Given an established grass lawn and the necessary tools, equipment, and supplies, care for and maintain the lawn. All items on an instructor-prepared checklist must be rated acceptable.

SELECTED ENABLING OBJECTIVES

E17.15.1 Develop a care and maintenance schedule.

E17.15.2 Mow a lawn.

E17.15.3 Trim a lawn.

E17.15.4 Fertilize and lime a lawn.

E17.15.5 Reseed a lawn.

E17.15.6 Remove undesirable materials.

E17.15.7 Recognize disease and insect damage.

E17.15.8 Identify weeds.

E17.15.9 Remove weeds.

CRITERION-REFERENCED MEASURE

C17.15 Lawn cared for and maintained, all items on an instructor-prepared checklist rated acceptable.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students develop a maintenance schedule for their lawns at home (E17.15.1).
2. Have students determine the proper cutting and trimming techniques and recommend action for a specific type of grass and apply to home lawn (E17.15.2, E17.15.3).
3. Have students apply fertilizer, lime, and seed to a lawn area within ± 10% of the specified rate (E17.15.4, E17.15.5).
4. Have students examine lawns, list problems, and report findings to the class (E17.15.6-E17.15.8).
5. Have students identify weeds in a lawn and determine if a weed killer is needed (E17.15.9).

SELECTED TOOLS AND MATERIALS

Instructor-prepared checklist
Mower
Edger
Rake
Trimmer
Clipper
Spreader
Seed
Fertilizer
Lime
Sprayer

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Lawns and Ground Cover. Vocational Education Productions.

Transparency: Fertilizer and pH in Illustrated Horticulture. Virginia Department of Education.

SELECTED REFERENCES

Fertilizer Programs for Maintaining Kentucky Bluegrass. Virginia Cooperative Extension Service.
Introductory Horticulture, Unit 35. Reily and Shry.
Lawn Fertilization in Virginia. Virginia Cooperative Extension Service.
Lawn Mower Safety, Publication 52. Virginia Cooperative Extension Service.
Lawn Weed Control. Virginia Cooperative Extension Service.

DUTY AREA

18. TRAINING FOR LEADERSHIP

TASKS/COMPETENCIES

18.1 Identify essential traits of leadership

18.2 Identify leadership principles

18.3 Identify opportunities for leadership

18.4 Demonstrate an understanding of the FFA

18.5 Use parliamentary procedure

18.6 Participate in in-class FFA activity (including advancement to greenhand degree)

18.7 Develop and give a prepared public speech

18.8 Demonstrate an awareness of the FFA constitution

18.9 Apply for chapter office

----------------Application--------------

DUTY AREA

18. TRAINING FOR LEADERSHIP

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

18.1 Identify essential traits of leadership

COURSE

Agricultural Science and Mechanics I (8006)

18.1

PERFORMANCE OBJECTIVE

P18.1 Given instructor's guidelines, identify with 85% accuracy the essential traits of leadership appropriate for the FFA.

SELECTED ENABLING OBJECTIVES

E18.1.1 Define leadership.

E18.1.2 Compare types of leaders.

E18.1.3 Describe how traits of leadership are exhibited.

E18.1.4 Name local, state, and national leaders.

E18.1.5 Identify traits of known leaders.

CRITERION-REFERENCED MEASURE

C18.1 Essential traits of leadership identified with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students give an oral report on the traits of their ideal leader (E18.1.1-E18.1.5).
2. Have students identify desirable and undesirable traits of known leaders (E18.1.2-E18.1.5).

SELECTED TOOLS AND MATERIALS

Worksheet: Many Facets of Leadership Skills, Appendix, Chapter 5-2, Advisor's Guide. FFA.

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Advisor's Guide, Chapter 5. FFA.
FFA Leadership and Personal Development. Ohio Curriculum Materials.
The FFA and You, Chapter 5. Bender et al.

DUTY AREA

18. TRAINING FOR LEADERSHIP

TASK/COMPETENCY

18.2 Identify leadership principles

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

18.2

PERFORMANCE OBJECTIVE

P18.2 Given instructor's guidelines, identify with 85% accuracy the leadership principles appropriate for the FFA.

SELECTED ENABLING OBJECTIVES

E18.2.1 Define leadership.

E18.2.2 Describe leadership principles used by known leaders.

E18.2.3 Compare the leadership principles used by different leaders.

CRITERION-REFERENCED MEASURE

C18.2 Leadership principles identified with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students discuss and identify leadership principles used by known leaders (E18.2.1-E18.2.3).

2. Have students practice using leadership characteristics to conduct FFA business (E18.5.1-E18.5.3).

SELECTED TOOLS AND MATERIALS

Worksheet: FFA Officer Worksheet, Appendix, Chapter 5-3, Advisor's Guide. FFA.

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

FFA Leadership and Personal Development. Ohio Curriculum Materials.
The FFA and You, Chapter 5. Bender et al.

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DUTY AREA

18. TRAINING FOR LEADERSHIP

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

18.3 Identify opportunities for leadership

COURSE

Agricultural Science and Mechanics I (8006)

18.3

PERFORMANCE OBJECTIVE

P18.3 Given instructor's guidelines, identify the opportunities for leadership within the FFA. The opportunities identified must include 80% of those opportunities identified on an instructor-prepared list.

SELECTED ENABLING OBJECTIVES

E18.3.1 Define leadership.

E18.3.2 Describe essential traits of leadership.

E18.3.3 Identify leadership principles.

E18.3.4 Identify leadership positions in which you have a personal interest.

E18.3.5 Select leadership positions in which you have a personal interest.

CRITERION-REFERENCED MEASURE

C18.3 Opportunities for leadership within the FFA identified, including 80% of the opportunities identified on an instructor-prepared list.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students study the essential traits and principles of leadership (E18.3.1-E18.3.3).
2. Have students identify leadership positions within the FFA (E18.3.4).
3. Have students identify activities associated with the identified leadership positions (E18.3.4).
4. Have students select leadership positions that interest them (E18.3.5).

SELECTED TOOLS AND MATERIALS

Instructor-prepared list of leadership opportunties

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

The FFA and YOU, Chapter 5. Bender et al.
Student Handbook, Chapter 5. FFA.

DUTY AREA

18. TRAINING FOR LEADERSHIP

TASK/COMPETENCY

18.4 Demonstrate understanding of the FFA

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006)

18.4

PERFORMANCE OBJECTIVE

P18.4 Given instructor's guidelines, demonstrate an understanding of the FFA by scoring 80% on a written test.

SELECTED ENABLING OBJECTIVES

E18.4.1 Define FFA.

E18.4.2 Identify major events in the history of the FFA.

E18.4.3 Describe the aim and purposes of the FFA.

E18.4.4 Explain the importance of the FFA to the student, the teacher, the school, and the community.

E18.4.5 Explain the FFA creed and motto.

E18.4.6 Recite the FFA creed.

E18.4.7 Describe the four types of FFA membership.

E18.4.8 Identify the national FFA colors.

E18.4.9 Match each symbol of the FFA emblem to the appropriate meaning.

E18.4.10 Explain the role of the FFA in the total vo-ag program.

CRITERION-REFERENCED MEASURE

C18.4 An understanding of the FFA demonstrated by scoring 80% on a written test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students read and study the Student Handbook (E18.4.1-E18.4.10).
2. Have former members talk to the class (E18.4.1-E18.4.10).
3. Discuss ways the FFA is an asset to the community (E18.4.3, E18.4.4).
4. Determine the needs of members and discuss plans as to how the FFA can meet their needs (E18.4.1-E18.4.10).
5. Have members make plans and set goals as to how they can secure maximum benefits from the FFA (E18.4.1-E18.4.10).

SELECTED TOOLS AND MATERIALS

Use numerous resources provided in Advisor's Guide.
FFA paraphernalia

SELECTED AUDIOVISUAL MATERIALS

Film: FFA--The Learning and the Land. FFA.

SELECTED REFERENCES

Advisor's Guide. FFA.
Student Handbook. FFA.
The FFA and YOU, Chapter 1. Bender et al.

DUTY AREA

18. TRAINING FOR LEADERSHIP

TASK/COMPETENCY

18.5 Use parliamentary procedure

Application

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics I (8006) & II (8008)

18.5

PERFORMANCE OBJECTIVE

P18.5 Given a student organization meeting, use parliamentary procedure to conduct business. The meeting must proceed according to parliamentary law, all items on instructor-prepared checklist rated acceptable.

SELECTED ENABLING OBJECTIVES

E18.5.1 Explain why parliamentary procedure is used.

E18.5.2 Define terms associated with parliamentary procedure.

E18.5.3 Outline the general steps in conducting business during a meeting.

E18.5.4 State a motion correctly.

E18.5.5 Explain the correct procedure to amend a motion.

E18.5.6 Explain the voting procedures on motions.

E18.5.7 Name the five classes of motions.

E18.5.8 Name the motions that do not require a second.

E18.5.9 Name the debatable and non-debatable motions.

E18.5.10 Name the motions that are amendable.

E18.5.11 Conduct a meeting.

CRITERION-REFERENCED MEASURE

C18.5 Parliamentary procedure used in conducting business meeting, all items on instructor-prepared checklist rated acceptable.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students study and discuss chapter 4 in the Student Handbook (E18.5.1-E18.5.11).
2. Have students practice parliamentary procedure, and take turns serving as the presiding officer (E18.5.4-E1-E18.5.11).
3. Divide the class and participate in solving parliamentary problems (E18.5.4-E18.5.11).
4. Have the class demonstrate parliamentary procedure at an assembly (E18.5.11).

SELECTED TOOLS AND MATERIALS

Worksheet: Order of Business, Appendix, Chapter 3-5. Advisor's Guide.
Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

Videotape: Parliamentary Procedure. Area Agricultural Education Office.
Filmstrip/cassette: Parliamentary Procedure. Area Agricultural Education Office.

SELECTED REFERENCES

Advisors Guide, Chapter 4. FFA.
The FFA and You, Chapter 15. Bender et al.
Robert's Rules of Order. Robert.
Student Handbook, Chapter 4. FFA.

----------------Application--------------

DUTY AREA

18. TRAINING FOR LEADERSHIP

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

18.6 Participate in in-class FFA activity (including advancement to greenhand degree)

COURSE

Agricultural Science and Mechanics I (8006)

18.6

PERFORMANCE OBJECTIVE

P18.6 Given an opportunity for in-class FFA activities, participate in in-class FFA activity, including advancement to greenhand degree. The activity must conform to the instructor's written guidelines.

SELECTED ENABLING OBJECTIVES

E18.6.1 Select an in-class activity.

E18.6.2 Develop the objectives of the activity.

E18.6.3 Examine courses of action.

E18.6.4 Select the procedures to follow.

E18.6.5 Complete the objectives.

E18.6.6 Evaluate the activity.

CRITERION-REFERENCED MEASURE

C18.6 Participation in in-class FFA activity, including advancement to greenhand degree, conforming to instructor's written guidelines.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Provide the class with a list of potential FFA class activities. Have them select one and participate according to democratic problem-solving procedures (E18.6.1-E18.6.6).
2. Have class discuss objectives of the activities (E18.6.5).
3. Have class discuss ways of evaluating activities (E18.6.6).

SELECTED TOOLS AND MATERIALS

Written guidelines for in-class activity.

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Official FFA Manual. FFA.
Student Handbook. FFA.

----------------Application--------------

DUTY AREA

18. TRAINING FOR LEADERSHIP

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

18.7 Develop and give a prepared public speech

COURSE

Agricultural Science and Mechanics I (8006) & II (8008)

18.7

PERFORMANCE OBJECTIVE

P18.7 Given a topic of interest, develop and give a prepared public speech of 6-8 minutes duration, using accepted public speaking techniques as designated in the FFA National Contest Bulletin #4.

SELECTED ENABLING OBJECTIVES

E18.7.1 Identify the values of developing and delivering a speech.

E18.7.2 Identify the types of a speech.

E18.7.3 List the main parts of a speech.

E18.7.4 Select a speech topic.

E18.7.5 Plan the speech.

E18.7.6 Identify the qualities of a good speaker.

E18.7.7 Identify acceptable public speaking techniques.

E18.7.8 Practice the speech.

E18.7.9 Evaluate the speech.

CRITERION-REFERENCED MEASURE

C18.7 A 6-8 minute public speech developed and given as specified in the National FFA Contest Bulletin #4.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Explain the importance of developing and delivering a speech (E18.7.1).
2. Have students listen to speeches, identify the type of each speech, and list the main parts of a speech (E18.7.2-E18.7.3).
3. Have students prepare a speech on topics of individual interest (E18.7.4, E18.7.5).
4. Have students present a speech to class and evaluate it with the aid of members of the class (E18.7.6-E18.7.9).

SELECTED TOOLS AND MATERIALS

Score sheet - National Public Speaking Contest

SELECTED AUDIOVISUAL MATERIALS

Cassette: National Public Speaking Contest. FFA.

SELECTED REFERENCES

Bulletin #4. FFA.
The FFA and You, Chapter 5. Bender et al.

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DUTY AREA

18. TRAINING FOR LEADERSHIP

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

18.8 Demonstrate an awareness of the FFA constitution

COURSE

Agricultural Science and Mechanics II (8008)

18.8

PERFORMANCE OBJECTIVE

P18.8 Given a copy of the FFA constitution, demonstrate an awareness of the FFA constitution by locating information as specified by the instructor.

SELECTED ENABLING OBJECTIVES

E18.8.1 Identify sections of the constitution.

E18.8.2 Locate information in the constitution.

CRITERION-REFERENCED MEASURE

C18.8 Awareness of the FFA constitution demonstrated by locating specified information.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Prepare questions related to information found in the constitution, and have students answer the questions (E18.8.1, E18.8.2).
2. Have students propose amendments to the FFA constitution and give reasons for their proposals (E18.8.1, E18.8.2).

SELECTED TOOLS AND MATERIALS

Instructor-prepared list of questions
related to information in the constitution

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Official FFA Manual. FFA.

DUTY AREA

18. TRAINING FOR LEADERSHIP

TASK/COMPETENCY

18.9 Apply for chapter office

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

18.9

PERFORMANCE OBJECTIVE

P18.9 Given a real or simulated office vacancy in the local chapter, apply for a chapter office. Applicant must follow the procedures set up by the local chapter in applying for an office.

SELECTED ENABLING OBJECTIVES

E18.9.1 Identify duties of FFA officers.

E18.9.2 Identify qualifications of FFA officers.

E18.9.3 Conduct a self-analysis.

E18.9.4 Select an office.

E18.9.5 Complete an application for office.

E18.9.6 Display qualities of leadership.

E18.9.7 Prepare to be an officer.

CRITERION-REFERENCED MEASURE

C18.9 Chapter office applied for, following local procedures.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students complete FFA Officer Worksheet in identifying duties of officers (E18.9.1, E18.9.2).
2. Have students complete A Deep Hard Look at Me. (E18.9.3).
3. Have student follow the application procedures of the local chapter (E18.9.4, E18.9.5).
4. Have students continue to develop qualities of leadership necessary to be a good FFA officer (E18.19.6, E18.9.7).

SELECTED TOOLS AND MATERIALS

Worksheets: FFA Officer Worksheet in Advisor's Guide. FFA.
A Deep Hard Look at Me in Advisor's Guide. FFA.
Chapter Application for the Office of ________ in Advisor's Guide. FFA.

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Advisor's Guide. FFA.
Official FFA Manual. FFA.
Student Handbook. FFA.

DUTY AREA

19. CONSERVING NATURAL RESOURCES

TASKS/COMPETENCIES

19.1 Describe methods of conserving natural resources

19.2 Develop a forest fire prevention plan

19.3 Plan and establish a wildlife food plot

19.4 Plant forest seedlings

19.5 Identify Virginia forest trees

19.6 Identify common Virginia game fish

19.7 Identify common Virginia game animals and game birds

19.8 List common game and fish laws in Virginia

19.9 Identify methods used to conserve water

19.10 Identify methods used to conserve soil

19.11 Participate in Keep Virginia Green program

19.12 Manage a small woodlot

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DUTY AREA

19. CONSERVING NATURAL RESOURCES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

19.1 Describe methods of conserving natural resources

COURSE

Agricultural Science and Mechanics I (8006)

19.1

PERFORMANCE OBJECTIVE

P19.1 Given resource materials, describe methods of conserving natural resources. The descriptions must contain 85% of the elements on an instructor-prepared checklist.

SELECTED ENABLING OBJECTIVES

E19.1.1 Describe methods used to conserve energy.

E19.1.2 Describe methods used to conserve soil.

E19.1.3 Describe methods used to conserve water.

E19.1.4 Describe methods used to conserve air.

E19.1.5 Describe methods used to conserve wildlife.

CRITERION-REFERENCED MEASURE

C19.1 Methods of conserving natural resources described, containing 85% of elements on an instructor-prepared checklist.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students conduct an energy analysis and discuss Chapter 2 in Conservation Farming (E19.1.1).
2. Discuss Chapter 4 in Conservation Farming (E19.1.2).
3. Discuss Chapter 3 in Conservation Farming (E19.1.3).
4. Discuss methods used locally to conserve air (E19.1.4).
5. Discuss methods used locally to conserve wildlife (E19.1.5).

SELECTED TOOLS AND MATERIALS

Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

Filmstrip/cassette: Agriculture and the Environment. NASCO.

SELECTED REFERENCES

Conservation Farming. Deere and Company.
Farm Energy Analysis. The National Food and Energy Council.
Mechanics in Agriculture, Chapter 40. Phipps.
Wildlife Conservation in Virginia. Outdoor Empire Publishing, Inc..

DUTY AREA

19. CONSERVING NATURAL RESOURCES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

19.2 Develop a forest fire prevention plan

COURSE

Agricultural Science and Mechanics I (3006)

19.2

PERFORMANCE OBJECTIVE

P19.2 Given a local community and information on fire prevention, develop a forest fire prevention plan. Plan must be judged acceptable according to an instructor-prepared checklist.

SELECTED ENABLING OBJECTIVES

E19.2.1 List five sources of forest fires.

E19.2.2 List three reasons why forest fires should be kept out of woods.

E19.2.3 Identify areas to be protected.

E19.2.4 List steps to follow if a forest fire is detected.

E19.2.5 Explain the four o'clock burning law.

E19.2.6 Explain the correct procedure to drown a camp fire.

E19.2.7 Identify correct methods of trash disposal.

E19.2.8 Identify community activities to prevent forest fires.

CRITERION-REFERENCED MEASURE

C19.2 Forest fire prevention plan developed, acceptable according to an instructor-prepared checklist.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Invite the local forest fire warden or forester to talk to the class on forest fire prevention (E19.2.1-E19.2.8).
2. Have students report on forest fire damage in their communities. Summarize the reports (E19.2.1-E19.2.8).
3. Have students develop plans to protect their property from fire (E19.2.8).
4. Have students include forest fire prevention in the local FFA Safety Program (E19.2.8).

SELECTED TOOLS AND MATERIALS

Brochures from local forester
Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Protecting Forest From Forest Fires. NASCO.

SELECTED REFERENCES

Forestry in Agricultural Education in Virginia. Virginia Department of Education.
You and Forest Fires. U. S. Government Printing Office.

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DUTY AREA

19. CONSERVING NATURAL RESOURCES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

19.3 Plan and establish a wildlife food plot

COURSE

Agricultural Science and Mechanics I (8006)

19.3

PERFORMANCE OBJECTIVE

P19.3	Given access to the necessary land and resources, plan and establish a wildlife food plot. The plot must be planned and established according to the procedures recommended by the instructor.

SELECTED ENABLING OBJECTIVES

E19.3.1	Name the advantages of establishing wildlife plots.
E19.3.2	Identify desirable location characteristics for wildlife plots.
E19.3.3	Identify materials that provide food and cover.
E19.3.4	Select planting sites.
E19.3.5	Determine amount of wildlife seed needed.
E19.3.6	Determine amount and analysis of fertilizer needed.
E19.3.7	Obtain wildlife seed.
E19.3.8	Prepare seedbed.
E19.3.9	Plant wildlife plots.

CRITERION-REFERENCED MEASURE

C19.3	Wildlife food plot planned and established following procedures recommended by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Conduct a field trip to two or three farms to examine the suitability of areas for wildlife plots (E19.3.1-E19.3.4).
2. Have students plan the amount of materials needed (E19.3.5, E19.3.6).
3. Obtain seed from the Game Commission (E19.3.7).
4. Have students establish wildlife plots on their home farms or farms of neighbors (E19.3.8, E19.3.9).
5. Have urban students plan backyard habitat (E19.3.8, E19.3.9).

SELECTED TOOLS AND MATERIALS

Wildlife seed
Locate farms for field trips

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

The Farmer and Wildlife. Wildlife Management Institute.
Invite Wildlife to Your Back Yard. National Wildlife Federation.
Wildlife Conservation in Virginia, Unit 4. Outdoor Empire Publishing.

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DUTY AREA

19. CONSERVING NATURAL RESOURCES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

19.4 Plant forest seedlings

COURSE

Agricultural Science and Mechanics I (8006)

19.4

PERFORMANCE OBJECTIVE

P19.4 Given a prepared site, seedlings, and the necessary tools, plant forest seedlings. The seedlings must be spaced as specified, planted slightly deeper than grown in nursery, and must be hard to remove from the earth with the hand.

SELECTED ENABLING OBJECTIVES

E19.4.1 Describe the site conditions favorable for planting.

E19.4.2 Describe the characteristics of a healthy seedling.

E19.4.3 Identify tools used in planting.

E19.4.4 Identify safety practices to follow in planting.

E19.4.5 Store seedlings prior to planting.

E19.4.6 Select spacing.

E19.4.7 Prepare hole for seedling.

E19.4.8 Place seedling in hole.

E19.4.9 Firm soil around seedling.

E19.4.10 Pull on seedling to test for correct planting.

CRITERION-REFERENCED MEASURE

C19.4 Forest seedlings planted with specified spacing, placed slightly deeper than grown in nursery, and hard to remove by hand.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students observe reforestation and demonstrate the correct procedures (E19.4.1-E19.4.10).
2. Have a forester talk to the class on the values of a tree farm (E19.4.1, E19.4.2).
3. Conduct a field trip to a forest tree nursery (E19.4.2).
4. Have students prepare a tree planting bar (E19.4.3).
5. Have students plant seedlings as part of the supervised occupational experience program, or have them assist a local farmer (E19.4.7-E19.4.10).

SELECTED TOOLS AND MATERIALS

Seedlings
Planting bar
Shovel
Mattock
Bucket

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Virginia Forests--Reproducing the Forest. Virginia Department of Education.

SELECTED REFERENCES

Forestry in Agricultural Education in Virginia. Virginia Department of Education.
A Guide for Using the Forestry Conservation Lesson Material. Virginia Department of Education.
Successful Tree Planting. Virginia Division of Forestry.

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DUTY AREA

19. CONSERVING NATURAL RESOURCES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

19.5 Identify Virginia forest trees

COURSE

Agricultural Science and Mechanics II (8008)

19.5

PERFORMANCE OBJECTIVE

P19.5 Given a selection of trees native to Virginia, identify the trees with 85% accuracy on a written or oral test.

SELECTED ENABLING OBJECTIVES

E19.5.1 Classify trees.

E19.5.2 Identify the parts of a tree.

E19.5.3 Describe the shape of the crown.

E19.5.4 Describe the features of the bark.

E19.5.5 Describe the leaf characteristics.

E19.5.6 Desribe the characteristics of twigs and leaf-scars.

E19.5.7 Describe the characteristics of buds.

CRITERION-REFERENCED MEASURE

C19.5 Virginia forest trees identified with 85% accuracy on a written or oral test.

SELECTED INSTRUCTIONAL ACTIVITIES

Note: Teach this topic only when leaves are on the trees.

1. Have students use reference materials and classify trees as conifers, broad-leaf, evergreen, and/or deciduous. Closely coordinate classroom instruction with walks into the woods (E19.5.1).
2. Have the local foresters assist in identification during field trips (E19.5.2-E19.5.7).
3. Have students identify trees close to their homes and report to class (E19.5.2-E19.5.7).
4. Have students collect a leaf sample (E19.5.5).
5. Encourage students to participate in FFA forestry judging (E19.5.2-E19.5.7).

SELECTED TOOLS AND MATERIALS

Leaf collection
Wooded area

SELECTED AUDIOVISUAL MATERIALS

Filmstrips: Virginia Forests--Identifying Trees, Parts I & II. Virginia Department of Education.

SELECTED REFERENCES

Forestry in Agricultural Education in Virginia. Virginia Department of Education.
Education.
Forest Trees of Virginia. Virginia Division of Forestry.
A Guide for Using the Forestry Conservation Lesson Material. Virginia Department of

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DUTY AREA

19. CONSERVING NATURAL RESOURCES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

19.6 Identify common Virginia game fish

COURSE

Agricultural Science and Mechanics II (8008)

19.6

PERFORMANCE OBJECTIVE

P19.6 Given pictures of a variety of fish, identify common Virginia game fish with 85% accuracy on a written or oral test.

SELECTED ENABLING OBJECTIVES

E19.6.1 Compile a list of fish found in the local area.

E19.6.2 Label the major characteristics of each specie of fish.

E19.6.3 Identify the characteristics used to distinguish one specie from another.

E19.6.4 Distinguish between game and non-game fish.

CRITERION-REFERENCED MEASURE

C19.6 Common Virginia game fish identified with 85% accuracy on a written or oral test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students prepare a scrapbook of fish pictures and label the major characteristics of each (E19.6.1-E19.6.3).
2. Invite the game warden or fish biologist to talk to the class on fish identification (E19.6.1-E19.6.4).
3. Have students set up an aquarium (E19.6.1-E19.6.4).

SELECTED TOOLS AND MATERIALS

Pictures of fish

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Wildlife Conservation in Virginia, Unit 7. Outdoor Empire Publishing.

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DUTY AREA

19. CONSERVING NATURAL RESOURCES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

19.7 Identify common Virginia game animals and game birds

COURSE

Agricultural Science and Mechanics II (8008)

19.7

PERFORMANCE OBJECTIVE

P19.7 Given pictures of a variety of game animals and game birds, identify common Virginia game animals with 85% accuracy on a written or oral test.

SELECTED ENABLING OBJECTIVES

E19.7.1 Compile a list of game animals and game birds found in the local area.

E19.7.2 List the major characteristics of each specie.

E19.7.3 Identify the characteristics used to distinguish one specie from another.

CRITERION-REFERENCED MEASURE

C19.7 Common Virginia game animals and game birds identified with 85% accuracy on a written or oral test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students prepare a bulletin board on wildlife (E19.7.1-E19.7.3).
2. Write the game warden to talk to the class on wildlife identification (E19.7.1, E19.7.2).
3. Compare the characteristics of wildlife that help to distinguish one specie from another (E19.7.3).

SELECTED TOOLS AND MATERIALS

Bulletin board
Pictures of wildlife

SELECTED AUDIOVISUAL MATERIALS

Films: Select from list in Wildlife Conservation in Virginia.

SELECTED REFERENCES

Wildlife Conservation in Virginia, Unit 3. Outdoor Empire Publishing.
Wildlife of Farm and Field. National Wildlife Federation.

DUTY AREA

19. CONSERVING NATURAL RESOURCES

TASK/COMPETENCY

19.8 List common game and fish laws in Virginia

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

19.8

PERFORMANCE OBJECTIVE

P19.8 Given a simulated hunting or fishing situation, list common game and fish laws that apply. The list must include 80% of those on an instructor-prepared list.

SELECTED ENABLING OBJECTIVES

E19.8.1 Define terms pertinent to hunting and fishing laws.

E19.8.2 Explain the ownership status of wildlife.

E19.8.3 Locate sources of game and fish laws.

E19.8.4 Identify game and fish laws common to the local area.

CRITERION-REFERENCED MEASURE

C19.8 Common game and fish laws in Virginia listed, including 80% of those on an instructor-prepared list.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have the game warden talk to the class on game and fish laws (E19.8.1-E19.8.4).
2. Have students prepare a list of regulations that will affect them (E19.8.4).
3. Have students determine the fees required for different hunting and fishing situations (E19.8.4).

SELECTED TOOLS AND MATERIALS

Summary of Virginia Game Laws. Commission of Game and Inland Fisheries.
Instructor-prepared list of game and fish laws

SELECTED AUDIOVISUAL MATERIALS

Films: Select from list in Wildlife Conservation in Virginia.

SELECTED REFERENCES

Wildlife Conservation in Virginia, Unit 12. Outdoor Empire Publishing.

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DUTY AREA

19. CONSERVING NATURAL RESOURCES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

19.9 Identify methods used to conserve water

COURSE

Agricultural Science and Mechanics II (8008)

19.9

PERFORMANCE OBJECTIVE

19.9 Given a selection of pictures depicting water conservation methods, identify methods used to conserve water with 85% accuracy.

SELECTED ENABLING OBJECTIVES

E19.9.1 Locate subsurface drainage practices.

E19.9.2 Locate surface drainage systems.

E19.9.3 Identify types of drains.

E19.9.4 List advantages of drainage systems.

CRITERION-REFERENCED MEASURE

C19.9 Methods to conserve water identified with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Conduct a field trip to where drain tiles, perforated pipe, terraces, and drain ditches are being installed. Discuss the advantages and disadvantages (E19.9.1-E19.9.4).
2. Have students report on water conservation methods they use (E19.9.1-E19.9.4).

SELECTED TOOLS AND MATERIALS

Samples of drain tiles and pipe
Pictures of terraces and drain ditches

SELECTED AUDIOVISUAL MATERIALS

Slides: Conservation Farming. Deere and Company.

SELECTED REFERENCES

Conservation Farming, Chapter 3. Deere and Company.

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DUTY AREA

19. CONSERVING NATURAL RESOURCES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

19.10 Identify methods used to conserve soil

COURSE

Agricultural Science and Mechanics II (8008)

19.10

PERFORMANCE OBJECTIVE

P19.10 Given a selection of soil erosion control situations, identify methods to conserve soil with 85% accuracy.

SELECTED ENABLING OBJECTIVES

E19.10.1 Define erosion.

E19.10.2 Identify types of soil erosion caused by water.

E19.10.3 Identify types of soil erosion caused by wind.

E19.10.4 Identify erosion control practices.

CRITERION-REFERENCED MEASURE

C19.10 Methods used to conserve soil identified with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students describe eroded areas near their home (E19.10.1).
2. Have students identify the four types of soil erosion caused by water: sheet, rill, gully, and streambank (E19.10.2).
3. Visit experimental areas which are used to measure the amount of soil erosion (E19.10.1-E19.10.4).
4. Use pictures to identify soil erosion by wind (E19.10.3).
5. Have students describe areas where erosion control practices are used (E19.10.4).

SELECTED TOOLS AND MATERIALS

Pictures of wind erosion

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Consider the Soil First. NASCO.

SELECTED REFERENCES

Conservation Farming, Chapter 4. Deere and Company.
Mechanics in Agriculture, Chapter 40. Phipps.
Terraces...A Best Management Practice. Virginia Cooperative Extension Service.

DUTY AREA

19. CONSERVING NATURAL RESOURCES

TASK/COMPETENCY

19.11 Participate in Keep Virginia Green program

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

19.11

PERFORMANCE OBJECTIVE

P19.11 Given a local Keep Virginia Green program, participate in the program. Participation should be according to the objectives and activities of the local Keep Virginia Green crew.

SELECTED ENABLING OBJECTIVES

E19.11.1 List the four main parts of a forest fire.

E19.11.2 Diagram a fire situation.

E19.11.3 Explain the direct attack method of fire control.

E19.11.4 Explain the indirect attack method of fire control.

E19.11.5 Explain mopping-up procedures.

E19.11.6 Give the general location of local forest warden.

E19.11.7 Identify tools used in forest fire control.

E19.11.8 Attend training sessions (KVG crew).

CRITERION-REFERENCED MEASURE

C19.11 Keep Virginia Green program participated in according to objectives and activities of the local organization.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have the forest warden and/or forester discuss methods used to combat forest fires and provide training for students (E19.11.1-E19.11.8).
2. Have students list training objectives of Keep Virginia Green crew (E19.11.8).
3. Have students outline procedures for different methods of fire control (E19.11.3-E19.11.4).

SELECTED TOOLS AND MATERIALS

Fire fighting tools

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Forestry in Agricultural Education in Virginia. Virginia Department of Education.

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DUTY AREA

19. CONSERVING NATURAL RESOURCES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

19.12 Manage a small woodlot

COURSE

Agricultural Science and Mechanics II (8008)

19.12

PERFORMANCE OBJECTIVE

P19.12 Given access to a small woodlot, manage the woodlot. Recommended management practices must agree with 85% of those recommended by the instructor or forester.

SELECTED ENABLING OBJECTIVES

E19.12.1 Identify trees in the area.

E19.12.2 Analyze the stand of timber.

E19.12.3 Determine the type of cutting needed, if any.

E19.12.4 Explain improvement cuttings.

E19.12.5 Describe the features of a thinning operation.

E19.12.6 Determine management objective for the woodlot.

E19.12.7 Explain the types of harvest cuttings.

E19.12.8 Explain the Virginia Seed Tree Law.

CRITERION-REFERENCED MEASURE

C19.12 Small woodlot managed, management practices agreeing with 85% of the practices recommended by the instructor or forester.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Tag several trees in an area and have students identify them (E19.12.1).
2. Have students determine the composition of the stand, forest type, age, age distribution, growth rate, size, trees per acre, quality of site, products available, and if reproduction is needed (E19.12.2).
3. Conduct field trips to observe all types of cuttings. Discuss why types of cuttings are justified (E19.12.3-E19.12.7).
4. Have the forester discuss the Virginia Seed Tree law. Observe some areas where practice has been implemented (E19.12.8).
5. Have students apply management practices to home woodlots (E19.12.1-E19.12.8).

SELECTED TOOLS AND MATERIALS

Increment borer
Diameter tape
Biltmore stick
Forest Management Evaluation Scoresheet

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Managing the Forest. Virginia Division of Forestry.

SELECTED REFERENCES

Forestry in Agricultural Education in Virginia. Virginia Department of Education.
Forest Trees of Virginia. Virginia Division of Forestry.

DUTY AREA

20. IDENTIFYING BREEDS OF LIVESTOCK

TASKS/COMPETENCIES

20.1 Identify the importance, origin, and characteristics of breeds of beef cattle

20.2 Identify the importance, origin, and characteristics of breeds of dairy cattle

20.3 Identify the importance and characteristics of breeds of poultry

20.4 Identify the importance and characteristics of breeds of sheep

20.5 Identify the importance, origin, and characteristics of breeds of swine

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DUTY AREA

20. IDENTIFYING BREEDS OF LIVESTOCK

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

20.1 Identify the importance, origin, and characteristics of breeds of beef cattle

COURSE

Agricultural Science and Mechanics II (8008)

20.1

PERFORMANCE OBJECTIVE

P20.1 Given pictures or live beef animals, identify selected breeds of beef cattle and give the origin, importance and characteristics of each breed with 90% accuracy.

SELECTED ENABLING OBJECTIVES

E20.1.1 Describe the general characteristics of beef breeds.

E20.1.2 State the major importance of selected breeds.

E20.1.3 Identify the parts of a beef animal.

E20.1.4 Name the origin of selected breeds.

E20.1.5 Describe the characteristics of selected breeds.

E20.1.6 Compare the characteristics of one beef breed with another.

CRITERION-REFERENCED MEASURE

C20.1 Importance, origin, and characteristics of selected breeds of beef cattle identified with 90% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Survey beef producers in the community to determine what beef brands are used locally (E20.1.1).
2. Prepare a bulletin board displaying pictures of the beef breeds (E20.1.1, E20.1.6).
3. Have students bring in pictures of beef cattle (E20.1.1, E20.1.6).
4. Have students write to breed registry associations for information on the breed of their choice (E20.1.1-E20.1.6).

SELECTED TOOLS AND MATERIALS

Pictures of beef breeds
Names and addresses of breed registry associations

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: New and Exotic Breeds of Beef Cattle. NASCO.
Breeds of Beef Cattle. NASCO.
Beef Cattle Identification. Vocational Education Productions.

SELECTED REFERENCES

Modern Livestock and Poultry Production, Unit 11. Gillespie.

DUTY AREA

20. IDENTIFYING BREEDS OF LIVESTOCK

TASK/COMPETENCY

20.2 Identify the importance, origin, and characteristics of breeds of dairy cattle

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

20.2

PERFORMANCE OBJECTIVE

P20.2 Given pictures or live animals, identify the five major dairy breeds and give the origin, importance, and characteristics of each breed with 90% accuracy.

SELECTED ENABLING OBJECTIVES

E20.2.1 Name the five major breeds of dairy cattle.

E20.2.2 Describe the general characteristics of dairy breeds.

E20.2.3 Identify the parts of a dairy animal.

E20.2.4 State the major importance of selected breeds.

E20.2.5 Describe the breeds giving their breed characteristics and origin.

E20.2.6 Compare the characteristics of selected breeds.

CRITERION-REFERENCED MEASURE

C20.2 Importance, origin, and characteristics of the five major breeds of dairy cattle identified with 90% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students write to dairy breeds associations for literature about their breed (E20.2.1, E20.2.2, E20.2.4-E20.2.6).
2. Prepare a bulletin board display of pictures of the dairy breeds (E20.2.1, E20.2.6).
3. Have students bring in pictures of dairy breeds (E20.1.1).

SELECTED TOOLS AND MATERIALS

Pictures of dairy breeds
Names and addresses of breed registry associations

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Breeds of Dairy Cattle. NASCO.

SELECTED REFERENCES

Animal Science, Chapter 21. Ensminger.

DUTY AREA

20. IDENTIFYING BREEDS OF LIVESTOCK

TASK/COMPETENCY

20.3 Identify the importance and characteristics of breeds of poultry

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

20.3

PERFORMANCE OBJECTIVE

P20.3 Given pictures or live animals, identify breeds of poultry and give the importance and characteristics of each breed with 90% accuracy.

SELECTED ENABLING OBJECTIVES

E20.3.1 Describe the nature of the poultry industry.

E20.3.2 Identify common breeds of poultry.

E20.3.3 Describe the major breeds of poultry including characteristics of each breed.

CRITERION-REFERENCED MEASURE

C20.3.1 Importance and characteristics of the common breeds of poultry identified with 90% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Survey the local community to determine the common breeds of poultry used by local producers (E20.3.1-E20.3.3).
2. Prepare a bulletin board display of pictures of common breeds of poultry (E20.3.2).
3. Tour a poultry operation (E20.3.1-E20.3.3).

SELECTED TOOLS AND MATERIALS

Pictures of breeds of poultry

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Modern Livestock and Poultry Production, Unit 33. Gillespie.

----------------Application--------------

DUTY AREA

20. IDENTIFY BREEDS OF LIVESTOCK

TASK/COMPETENCY

20.4 Identify the importance and characteristics of breeds of sheep

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

20.4

PERFORMANCE OBJECTIVE

P20.4 Given pictures or live animals, accurately identify selected breeds of sheep and give the importance and characteristics of each breed with 90% accuracy.

SELECTED ENABLING OBJECTIVES

E20.4.1 Describe the general characteristics of sheep.

E20.4.2 Describe the classes of sheep.

E20.4.3 Identify the parts of a sheep.

E20.4.4 Identify the breeds of sheep.

E20.4.5 Describe the characteristics of selected breeds.

CRITERION-REFERENCED MEASURE

C20.4.1 Importance and characteristics of breeds of sheep identified with 90% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students write to breed registry associations for information on the breed of their choice (E20.4.1-E20.4.5).
2. Prepare a bulletin board display of pictures of breeds of sheep (E20.4.1, E20.4.4).
3. Survey local sheep producers to determine what breeds of sheep are being used (E20.4.4).
4. Have students bring in pictures of sheep (E20.4.4).

SELECTED TOOLS AND MATERIALS

Pictures of sheep
Names and addresses of breed registry associations

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Breeds of Sheep. NASCO
Slides: Sheep Breed Identification. Vocational Education Productions.

SELECTED REFERENCES

Animal Science, Chapter 28. Ensminger.
Modern Livestock and Poultry Production, Unit 24. Gillespie.

DUTY AREA

20. IDENTIFYING BREEDS OF LIVESTOCK

TASK/COMPETENCY

20.5 Identify the importance, origin, and characteristics of breeds of swine

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

20.5

PERFORMANCE OBJECTIVE

P20.5 Given pictures or live animals, accurately identify selected breeds of swine and give the origin, importance, and characteristics of each breed with 90% accuracy.

SELECTED ENABLING OBJECTIVES

E20.5.1 Describe the general characteristics of the types of swine.

E20.5.2 State the major importance of selected breeds.

E20.5.3 Identify the parts of a hog.

E20.5.4 Name the origin of selected breeds.

E20.5.5 Describe the characteristics of selected breeds.

E20.5.6 Compare the characteristics of different breeds.

CRITERION-REFERENCED MEASURE

C20.5.1 Importance, origin, and characteristics of selected breeds of swine identified with 90% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Observe the characteristics of the current breeds of swine on farms in the local area (E20.5.1).
2. Write to swine breed associations for literature about their breeds (E20.5.1-E20.5.5).
3. Have students compare characteristics of selected breeds (E20.5.6).

SELECTED TOOLS AND MATERIALS

Pictures of swine
Names and addresses of breed registry associations

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Breeds of Swine. NASCO.
Slides: Swine Breed Identification. Vocational Education Production.

SELECTED REFERENCES

Animal Science, Chapter 37. Ensminger.
Modern Livestock and Poultry Production, Unit 18. Gillespie.

DUTY AREA

21. SELECTING ANIMALS

TASKS/COMPETENCIES

21.1 Use judging terms

21.2 Use judging scorecard

21.3 Use and keep pedigree and performance records

21.4 Identify reasons for placing animals within classes

-----------------Application--------------

DUTY AREA

21. SELECTING ANIMALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

21.1 Use judging terms

COURSE

Agricultural Science and Mechanics II (8008)

21.1

PERFORMANCE OBJECTIVE

P21.1 Given access to one or more animals of the same species and judging terminology, use judging terms to describe the characteristics of the animal(s), with 80% of terms used corresponding to those used by the instructor in describing the same animal(s).

SELECTED ENABLING OBJECTIVES

E21.1.1 Identify parts of animal to be judged.

E21.1.2 Rank the relative importance of animal parts.

E21.1.3 List and describe characteristics to look for when judging.

E21.1.4 Compare the characteristics of one animal to the ideal type.

CRITERION-REFERENCED MEASURE

C21.1 Judging terms used with 80% corresponding to those used by the instructor in describing the same animal(s).

SELECTED INSTRUCTIONAL ACTIVITIES

1. Using pictures or live animals, have students name the parts and relative importance of parts of animals (E21.1.1, E21.1.2).
2. Have students describe the characteristics of ideal types of animals (E21.1.1, E21.1.3, E21.1.4).
3. Have students judges classes of livestock (E21.1.1-E21.1.4).

SELECTED TOOLS AND MATERIALS

Pictures of ideal types of animals

SELECTED AUDIOVISUAL MATERIALS

Computer Programs: Agri-ID Series. Agri-Farm Publications.
Slides/cassettes: Training Kit for Livestock Judges. Vocational Education Productions.

SELECTED REFERENCES

Animal Science. Ensminger.
Modern Livestock and Poultry Production. Gillespie.

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DUTY AREA

21. SELECTING ANIMALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

21.2 Use judging scorecard

COURSE

Agricultural Science and Mechanics II (8008)

21.2

PERFORMANCE OBJECTIVE

P21.2 Given an animal and the appropriate scorecard, use the judging scorecard to evaluate the animal. The total value obtained on the scorecard must be within 10% of that obtained by the instructor.

SELECTED ENABLING OBJECTIVES

E21.2.1 Identify the class of livestock for which different types of scorecards are to be used.

E21.2.2 Identify parts of animals referred to on the scorecard.

E21.2.3 Evaluate an animal using the appropriate scorecard.

E21.2.4 Total the scorecard.

E21.2.5 Place animals in classes.

CRITERION-REFERENCED MEASURE

C21.2 Judging scorecard used, score obtained within 10% of that obtained by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students select the appropriate scorecard (E21.2.1).
2. Have students identify parts of animals referred to on scorecard using pictures (E21.2.2).
3. Have students evaluate a class of animals using the scorecard (E21.2.3-E21.2.5).
4. Have students evaluate animals used in their SOEPs (E21.2.1-E21.2.5).

SELECTED TOOLS AND MATERIALS

Scorecards for different classes of animals
Pictures of animals to be judged

SELECTED AUDIOVISUAL MATERIALS

Slides: The Livestock Judging Slide Sets (19 sets). Vocational Education Productions.

SELECTED REFERENCES

Animal Science. Ensminger.
The Stockman's Handbook, Chapter 11. Ensminger.

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DUTY AREA

21. SELECTING ANIMALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

21.3 Use and keep pedigree and performance records

COURSE

Agricultural Science and Mechanics II (8008)

21.3

PERFORMANCE OBJECTIVE

P21.3 Given an animal operation with pedigree and performance records, use and keep pedigree and performance records. Student must maintain 80% accuracy in identifying records, identifying animals, and keeping records.

SELECTED ENABLING OBJECTIVES

E21.3.1 Identify production, pedigree, and health records.

E21.3.2 Identify types of information on records.

E21.3.3 Identify animals possessing desirable production characteristics by using records.

E21.3.4 Keep production/performance records.

CRITERION-REFERENCED MEASURE

C21.3 Pedigree and performance records used and kept, 80% accuracy maintained in identifying records, identifying animals, and keeping records.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students practice keeping and using pedigree and performance records (E21.3.1-E21.3.4).

2. Have students with livestock for SOEP illustrate how they use and keep pedigree and production records (E21.3.1-E21.3.4).

SELECTED TOOLS AND MATERIALS

Pedigree and performance records

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Animal Science, Chapter 3. Ensminger.
The Stockman's Handbook, Chapter 3. Ensminger.

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DUTY AREA

21. SELECTING ANIMALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

21.4 Identify reasons for placing animals within classes

COURSE

Agricultural Science and Mechanics II (8008)

21.4

PERFORMANCE OBJECTIVE

P21.4 Given a class of animals and scorecard, identify reasons for placing animals within classes. Student must identify 85% of the reasons identified by the instructor.

SELECTED ENABLING OBJECTIVES

E21.4.1 Compare an animal with the ideal type.

E21.4.2 Identify faults of animals.

CRITERION-REFERENCED MEASURE

C21.4 Reasons for placing animals within classes identified with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students use judging guides in The Stockman's Handbook to identify those characteristics which are considered common faults (E21.4.1, E21.4.2).
2. Have students identify faults of animals in their SOEPs (E21.4.2).

SELECTED TOOLS AND MATERIALS

Judging guides for animals

SELECTED AUDIOVISUAL MATERIALS

Slides: The Livestock Judging Slide Sets (9 sets). Vocational Education Productions.

SELECTED REFERENCES

Animal Science. Ensminger.
The Stockman's Handbook, Chapter 11. Ensminger.

DUTY AREA

22. FEEDING ANIMALS

TASKS/COMPETENCIES

22.1 Identify nutrient needs of farm animals

22.2 Describe how farm animals use feed

22.3 Describe the use of pasture to feed livestock

22.4 Describe the use of harvested forages in feeding livestock

22.5 Describe the use of grains in feeding livestock

22.6 Describe the use of protein supplement in rations

22.7 Describe the use of minerals in rations

22.8 Balance livestock rations

22.9 Select balanced rations for animals

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DUTY AREA

22. FEEDING ANIMALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

22.1 Identify nutrient needs of farm animals

COURSE

Agricultural Science and Mechanics II (8008)

22.1

PERFORMANCE OBJECTIVE

P22.1 Given an animal with known weight and age and information on nutrient needs, identify nutrient needs for the animal with 85% accuracy.

SELECTED ENABLING OBJECTIVES

E22.1.1 Define nutrient, vitamins, protein, and fat.

E22.1.2 List the functions of nutrients in the body.

E22.1.3 List the composition (water, protein, fat, and mineral matter) of the bodies of selected animals.

E22.1.4 List the composition of products produced by selected animals.

E22.1.5 List the characteristics and effects of vitamins.

CRITERION-REFERENCED MEASURE

C22.1 Nutrient needs of farm animal identified with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Discuss the need for nutrients (E22.1.1, E22.1.2).
2. Illustrate what happens when selected nutrients are not supplied to animals (E22.1.3-E22.1.5).
3. Have students identify the nutrient needs of animals in their SOEPs (E22.1.1-E22.1.5).

SELECTED TOOLS AND MATERIALS

Pictures of healthy animals
Pictures of animals with known nutrient deficiencies
National Research Council table of daily nutritive requirements for selected animals
Samples of nutrients

SELECTED AUDIOVISUAL MATERIALS

Selected animal science AV programs: Agri-Farm Productions.
Selected AVs according to breed of animal

SELECTED REFERENCES

Feeding Animals, Section I. Virginia Department of Education.
Modern Livestock and Poultry Production, Unit 6. Gillespie.
The Stockman's Handbook, Chapter 4. Ensminger.

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DUTY AREA

22. FEEDING ANIMALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

22.2 Describe how farm animals use feed

COURSE

Agricultural Science and Mechanics II (8008)

22.2

PERFORMANCE OBJECTIVE

P22.2 Given an animal of known age and weight and information on animal use of feed, describe how farm animals use feed with 85% accuracy on a written or oral test.

SELECTED ENABLING OBJECTIVES

E22.2.1	Explain the relationship of feed nutrients to body function.
E22.2.2	Explain the differences in plants and animals that affect livestock feeding.
E22.2.3	Describe animals' digestion and absorption of feed nutrients.
E22.2.4	Describe the types of digestive systems of farm animals.
E22.2.5	Identify the types of digestive system in each type of livestock.

CRITERION-REFERENCED MEASURE

C22.2 Farm animal's use of feed described with 85% accuracy on a written or oral test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students report on the relationship of proteins, carbohydrates, fats, minerals, water, antibiotics and feed additives, and implants to body functions (E22.2.1).
2. Discuss the differences in plants and animals (E22.2.2).
3. Discuss the processes in the use of feeds by animals (E22.2.3).
4. Have students discuss, describe, and explain the differences in types of digestive systems in each type of livestock (E22.2.4, E22.2.5).
5. Have students with livestock enterprises explain how their animals use feed (E22.2.1-E22.2.5).

SELECTED TOOLS AND MATERIALS

Illustrative digestive systems of animals

SELECTED AUDIOVISUAL MATERIALS

Selected animal science AV programs: Agri-Farm Productions.
Selected AVs according to breed of animal

SELECTED REFERENCES

Animal Science, Chapter 4. Ensminger.
Feeding Animals, Section II. Virginia Department of Education.
Modern Livestock and Poultry Production, Unit 5. Gillespie.

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DUTY AREA

22. FEEDING ANIMALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

22.3 Describe the use of pasture to feed livestock

COURSE

Agricultural Science and Mechanics II (8008)

22.3

PERFORMANCE OBJECTIVE

P22.3 Given livestock of known age and weight and information on pasture usage, describe the use of pasture to feed livestock. Students must score 80% on a prepared test.

SELECTED ENABLING OBJECTIVES

E22.3.1 List the general feeding value of pastures.

E22.3.2 Describe the three kinds of pastures.

E22.3.3 List the general effects of growth and maturity on pasture plants.

E22.3.4 Describe the economics of good pasture in relation to other types of feeds.

E22.3.5 List important factors in supplying and using pastures.

CRITERION-REFERENCED MEASURE

C22.3 Use of pasture to feed livestock described with 80% accuracy on a written test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students prepare reports on and discuss the importance of pasture in feeding livestock (E22.3.1-E22.3.5).
2. Have students prepare a bulletin board display comparing pasture to other feeds for livestock (E22.3.1-E22.3.5).
3. Have students with livestock determine their pasture needs (E22.3.1-E22.3.5).

SELECTED TOOLS AND MATERIALS

Tables depicting the feeding value of pastures at different stages of growth

SELECTED AUDIOVISUAL MATERIALS

Selected animal science AV programs: Agri-Farm Productions.

SELECTED REFERENCES

Feeding Animals, Section III. Virginia Department of Education.
The Stockman's Handbook, Section 5. Ensminger.

----------------Application--------------

DUTY AREA

22. FEEDING ANIMALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

22.4 Describe the use of harvested forages in feeding livestock

COURSE

Agricultural Science and Mechanics II (8008)

22.4

PERFORMANCE OBJECTIVE

P22.4 Given livestock of known age and weight and information of use of forages, describe the use of harvested forages in feeding livestock. Students must score 80% on a written test.

SELECTED ENABLING OBJECTIVES

E22.4.1 Identify types of harvested forages.

E22.4.2 Determine the appropriate content of harvested forages.

E22.4.3 Compare the feeding value of forages at various stages of growth.

E22.4.4 Explain how livestock are able to use roughages.

E22.4.5 Identify animals that can use roughages.

E22.4.6 Determine the most advantageous time to supply roughages to livestock.

E22.4.7 Calculate the amount of harvested forages to feed livestock.

E22.4.8 Explain how the quality of forages affects the nutrient needs of animals.

CRITERION-REFERENCED MEASURE

C22.4 Use of harvested forages in feeding livestock described with 80% accuracy on a written test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students identify, evaluate, and compare types of harvested forages (E22.4.1-E22.4.3).
2. Have students with livestock determine the type and nutritive value of forages used to feed their livestock (E22.4.1-E22.4.3).
3. Have students determine the types and amounts of forages to feed livestock (E22.4.4-E22.4.8).
4. Have students calculate the amount of forages they can use to feed their livestock (E22.4.7).

SELECTED TOOLS AND MATERIALS

Samples of harvested forages
Nutritive values of harvested forages at different stages of growth

SELECTED AUDIOVISUAL MATERIALS

Selected animal science AV programs: Agri-Farm Productions.

SELECTED REFERENCES

Feeding Animals, Section IV. Virginia Department of Education.
The Stockman's Handbook, Sections 6-7. Ensminger.

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DUTY AREA

22. FEEDING ANIMALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

22.5 Describe the use of grains in feeding livestock

COURSE

Agricultural Science and Mechanics II (8008)

22.5

PERFORMANCE OBJECTIVE

P22.5 Given livestock of known age and weight and information on grain usage, describe the use of grains in feeding livestock. Students must score 80% on a written test.

SELECTED ENABLING OBJECTIVES

E22.5.1 Give the classification and importance of grains in feeding livestock.

E22.5.2 Identify grains.

E22.5.3 List the general characteristics of grains.

E22.5.4 List the specific characteristics of each type of grain.

E22.5.5 Determine the approximate nutritive value of grains.

CRITERION-REFERENCED MEASURE

C22.5 Use of grains in feeding livestock described with 80% accuracy on a written test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students identify grains and determine their importance and characteristics (E22.5.1-E22.5.4).

2. Have students use tables to determine the approximate nutritive value of grains used in their SOEPs (E22.5.5).

3. Have students calculate the amounts of grains needed in the rations of animals (E22.5.5).

SELECTED TOOLS AND MATERIALS

Samples of grains
Table of nutritive values of grains
Laboratory test of nutritive value of a sample of grain

SELECTED AUDIOVISUAL MATERIALS

Selected animal science AV programs: Agri-Farm Productions.

SELECTED REFERENCES

Feeding Animals, Section V. Virginia Department of Education.
The Stockman's Handbook, Section 4. Ensminger.

----------------Application--------------

DUTY AREA

22. FEEDING ANIMALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

22.6 Describe the use of protein supplement in rations

COURSE

Agricultural Science and Mechanics II (8008)

22.6

PERFORMANCE OBJECTIVE

P22.6 Given livestock of known age and weight and information on use of protein supplements, describe and determine the use of protein supplement in rations. The amount of protein supplement must be within 10% of the amount determined by the instructor, and student must score 80% on a written test.

SELECTED ENABLING OBJECTIVES

E22.6.1 Give the classification and importance of protein supplement.

E22.6.2 Identify sources and kinds of protein supplement.

E22.6.3 List the specific characteristics and principal uses of supplements made from meat by-products and from plant by-products.

E22.6.4 Determine the nutritive value of protein supplements.

E22.6.5 Explain how the quality of protein in the supplement affects the production and feeding costs.

E22.6.6 Determine the amount of protein supplement to use in a ration.

CRITERION-REFERENCED MEASURE

C22.6 Use of protein supplement in rations described with 80% accuracy on a written test, amount determined within 10% of that determined by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students bring in samples of protein supplements, discuss their importance, identify sources and kinds, determine nutritive value, report on the specific uses and characteristics of each sample. (E22.6.1-E22.6.5).
2. Have students determine the amount of supplement in rations used to feed animals in their SOEPs (E22.6.6).
3. Have students observe the preparation of protein supplements (E22.6.1-E22.6.6).

SELECTED TOOLS AND MATERIALS

Samples of protein suppplements
Table nutritive values of protein supplements

SELECTED AUDIOVISUAL MATERIALS

Selected animal science AV programs: Agri-Farm Productions.

SELECTED REFERENCES

Feeding Animals, Section VI. Virginia Department of Education.
The Stockman's Handbook, pp. 218-219. Ensminger.

DUTY AREA	----------------**Application**-------------- **PROGRAM**
22. FEEDING ANIMALS	AGRICULTURAL SCIENCE AND MECHANICS
TASK/COMPETENCY	**COURSE**
22.7 Describe the use of minerals in rations	Agricultural Science and Mechanics II (8008)

22.7

PERFORMANCE OBJECTIVE

P22.7 Given livestock of known age and weight and information on use of minerals, describe the use of minerals in rations. Student must score 80% on a written test.

SELECTED ENABLING OBJECTIVES

E22.7.1 Give the function of minerals in livestock feed.

E22.7.2 Name the minerals needed by farm animals.

E22.7.3 Name the minerals likely to be deficient in livestock feeds.

E22.7.4 Give the general (low-medium-high) mineral content of feedstuffs.

E22.7.5 Identify sources of essential minerals for livestock.

E22.7.6 Determine the method of feeding minerals to livestock.

CRITERION-REFERENCED MEASURE

C22.7 Use of minerals in rations described with 80% accuracy on a written test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Discuss the use of minerals in rations (E22.7.1-E22.7.6).
2. Have students identify sources and methods of feeding minerals to livestock (E22.7.5, E22.7.6).

SELECTED TOOLS AND MATERIALS

Samples of minerals used in livestock feeds

SELECTED AUDIOVISUAL MATERIALS

Selected animal science AV programs: Agri-Farm Productions.

SELECTED REFERENCES

Feeding Animals, Section VII. Virginia Department of Education.
The Stockman's Handbook, pp. 227-230. Ensminger.

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DUTY AREA

22. FEEDING ANIMALS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

22.8 Balance livestock rations

COURSE

Agricultural Science and Mechanics II (8008)

22.8

PERFORMANCE OBJECTIVE

P22.8 Given an animal and the necessary materials, balance a livestock ration. The ration must supply the minimum daily requirements of dry matter, total protein, digestable protein, TDN, minerals, and vitamins to fulfill a specified purpose.

SELECTED ENABLING OBJECTIVES

E22.8.1 Identify the requirements a good ration should meet.

E22.8.2 Define a balanced ration.

E22.8.3 Determine the purpose for which the animal is being fed (maintenance, growth, lactation, etc.).

E22.8.4 Determine the nutrient needs of the animal for expected performance.

E22.8.5 Identify feedstuffs available.

E22.8.6 Analyze the nutrient content of available feed and supplement.

E22.8.7 Describe the procedures to follow in balancing the ration.

E22.8.8 Compute the ration.

CRITERION-REFERENCED MEASURE

C22.8 Livestock rations balanced supplying the minimum daily requirements for the animal to fulfull a specific purpose.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have each student compute a balanced ration for each kind of livestock included in the SOEP. Each student should use the feeds available and determine what feeds should be purchased (E22.8.1-E22.8.8).
2. Discuss the various purposes for which animals are fed (E22.8.3).
3. Have students list requirements for a good ration (E22.8.1).

SELECTED TOOLS AND MATERIALS

Examples of balanced rations
Nutrient requirements of animals
Feed composition tables

SELECTED AUDIOVISUAL MATERIALS

Computer programs: Dairy Ration Master. Agri-Farm Publications.

SELECTED REFERENCES

Feeding Animals. Virginia Department of Education.
Modern Livestock and Poultry Production, Unit 7. Gillespie.
The Stockman's Handbook, Section 4. Ensminger.

DUTY AREA

22. FEEDING ANIMALS

TASK/COMPETENCY

22.9 Select balanced rations for animals

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

22.9

PERFORMANCE OBJECTIVE

P22.9 Given a variety of rations for a class of livestock, select balanced rations for livestock. The ration must supply the minimum daily nutritional requirements and take into consideration (1) the supply of home-grown feeds, (2) the availability and price of purchased feeds, (3) the class and age of cattle, and (4) the length of the growing season.

SELECTED ENABLING OBJECTIVES

E22.9.1 Balance livestock rations.

E22.9.2 Estimate the supply of home-grown feeds.

E22.9.3 Estimate the availability and price of feeds.

E22.9.4 Determine the class and age of animals.

E22.9.5 Estimate the length of the growing season.

E22.9.6 Determine lowest cost ration.

E22.9.7 Select feedstuffs that must be added to selected ration.

CRITERION-REFERENCED MEASURE

C22.9 Balanced rations selected, taking into consideration (1) the supply of home-grown feeds, (2) the availability and price of purchased feeds, (3) the class and age of cattle, and (4) the length of the growing season, and providing the minimum daily nutritional requirements.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students practice balancing rations using home-grown feeds, considering the price of available feeds, considering the class, age, and length of the growing season (E22.9.1-E22.9.5).

2. Have students select the lowest cost ration that supplies the minimum daily nutritional requirements (E22.9.6, E22.9.7).

SELECTED TOOLS AND MATERIALS

Daily rations for all classes and kinds of livestock

SELECTED AUDIOVISUAL MATERIALS

Selected animal science AV programs: Agri-Farm Productions.

SELECTED REFERENCES

The Stockman's Handbook. Ensminger.

DUTY AREA

23. USING ELECTRICITY

TASKS/COMPETENCIES

23.1 Explain the principles of electricity

23.2 Identify and draw electrical symbols

23.3 Calculate resistance, volts, and amperes using Ohm's Law

23.4 Determine amount of electrical energy used

23.5 Determine cost of electrical energy used

23.6 Distinguish between parallel and series circuits

23.7 Identify electrical tools, equipment, and supplies

23.8 Demonstrate safety in working with electricity

23.9 Splice electrical wires

23.10 Connect wires with solderless connectors

23.11 Install electrical apparatus (switches, receptacles, fixtures, and finish plates)

23.12 Repair an appliance cord

23.13 Construct an approved electrical project

23.14 Clean and lubricate an electric motor

DUTY AREA

23. USING ELECTRICITY

TASK/COMPETENCY

23.1 Explain the principles of electricity

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

23.1

PERFORMANCE OBJECTIVE

P23.1 Given basic information on electricity, explain the principles of electricity with 85% accuracy on a written test.

SELECTED ENABLING OBJECTIVES

E23.1.1 Define circuit, conductor, insulator, amperes, volt, ohm, watt, kilowatt-hour, AC, DC, single-phase, and three-phase.

E23.1.2 Describe the make-up of the atom (electron theory).

E23.1.3 Explain magnetism and its relation to electricity.

CRITERION-REFERENCED MEASURE

C23.1 Principles of electricity explained with 85% accuracy on a written test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review common electrical terms (E23.2.1).
2. Show the filmstrip on electricity and magnetism (E23.1.2, E23.1.3).
3. Have students read and study the electron theory in AAVIM publication (E23.1.2)
4. Demonstrate how electricity works using the Electrical Teaching Center (E23.1.1-E23.1.3).

SELECTED TOOLS AND MATERIALS

Electrical Teaching Center

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Understanding Electricity and Electrical Terms. AAVIM.

SELECTED REFERENCES

Electricity and Wheels. General Motors.
Practical Electrical Wiring, Chapter 2. Richter and Schwan.
Understanding Electricity and Electrical Terms. AAVIM.

DUTY AREA

23. USING ELECTRICITY

TASK/COMPETENCY

23.2 Identify and draw electrical symbols

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

23.2

PERFORMANCE OBJECTIVE

P23.2 Given house plans with and without electrical symbols, identify and draw electrical symbols with 85% accuracy.

SELECTED ENABLING OBJECTIVES

E23.2.1 Identify electrical symbols.

E23.2.2 Label electricai symbols.

E23.2.3 Draw electrical symbols.

CRITERION-REFERENCED MEASURE

C23.2 Electrical symbols identified and drawn with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display a house plan with electrical symbols. Discuss the necessity for using symbols in house plans (E23.2.1).
2. Point out how additions to the three basic symbols are used to create most of the other symbols (E23.2.1).
3. Have students identify symbols on house plans (E23.2.1).
4. Have students complete LAP-AMS 4 or draw electrical symbols on house plans (E23.2.2, E23.2.3).

SELECTED TOOLS AND MATERIALS

LAP-AMS 4: Diagraming Electrical Wiring. Virginia Department of Education.

SELECTED AUDIOVISUAL MATERIALS

Transparency: Common Electrical Symbols, TM 1-2, Electrical Wiring, Teacher Guide. AAVIM.

SELECTED REFERENCES

Agricultural Wiring Handbook. Currence and McFate.
Diagraming Electrical Wiring. Virginia Department of Education.
Electrical Wiring, Teacher Guide. AAVIM.
Practical Electrical Wiring, Chapter 16. Richter and Schwan.

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DUTY AREA

23. USING ELECTRICITY

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

23.3 Calculate resistance, volts, and amperes using Ohm's Law.

COURSE

Agricultural Science and Mechanics II (8008)

23.3

PERFORMANCE OBJECTIVE

P23.3 Given an electrical heater of known wattage, calculate resistance, volts, and amperes with 85% accuracy using Ohm's Law.

SELECTED ENABLING OBJECTIVES

E23.3.1 Define common electrical terms.

E23.3.2 Give the formula for Ohm's Law.

E23.3.3 Calculate resistance.

E23.3.4 Calculate volts.

E23.3.5 Calculate amperes.

CRITERION-REFERENCED MEASURE

C23.3 Resistance, volts, and amperes calculated with 85% accuracy using Ohm's Law.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Give Demonstration II (Electricity) using the Electrical Teaching Center (E23.3.1-E23.3.5).
2. Provide students with practical exercises using Ohm's Law (E23.3.2-E23.3.5).
3. Have students use Ohm's Law to calculate resistance, volts, and amperes for items at home (E23.3.2-E23.5).

SELECTED TOOLS AND MATERIALS

Electrical Teaching Center
Instructor-prepared transparency: Ohm's Law
Heater or toaster

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Electricity: Demonstrations for the Electrical Teaching Center. Virginia Department of Education.
Practical Electrical Wiring, Chapter 2. Richter and Schwan.

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DUTY AREA

23. USING ELECTRICITY

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

23.4 Determine amount of electrical energy used

COURSE

Agricultural Science and Mechanics II (8008)

23.4

PERFORMANCE OBJECTIVE

P23.4 Given an electrical appliance and necessary equipment, determine amount of electrical energy used within 15% of that obtained by the instructor.

SELECTED ENABLING OBJECTIVES

E23.4.1 Use the watt-and-time estimate method.

E23.4.2 Use the meter-disk revolution counting method.

E23.4.3 Use the check-meter method.

E23.4.4 Read a pointer-type register.

E23.4.5 Calculate energy used over a period of time.

CRITERION-REFERENCED MEASURE

C23.4 Energy used determined within 15% of that determined by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the three methods of determining energy consumed through using the Electrical Teaching Center--Demonstrations III and IV (E23.4.1-E23.4.4).
2. Provide practical exercises for student practice (E23.4.1-E23.4.5).
3. Have students determine energy consumption for appliances at home (E23.4.1-E23.4.5).

SELECTED TOOLS AND MATERIALS

Electrical appliance
Check meter
Clock or watch
Electrical Teaching Center

SELECTED AUDIOVISUAL MATERIALS

Filmstrip or slides: Determining Amount Used and Cost of Electrical Energy. AAVIM.

SELECTED REFERENCES

Electricity, Demonstrations III and IV. Virginia Department of Education.
Understanding Electricity and Electrical Terms. AAVIM.

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DUTY AREA

23 USING ELECTRICITY

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

23.5 Determine cost of electrical energy used

COURSE

Agricultural Science and Mechanics II (8008)

23.5

PERFORMANCE OBJECTIVE

P23.5 Given the electrical usage of a farm or business and rate schedules, determine the cost of electrical energy within 15% of that determined by the instructor.

SELECTED ENABLING OBJECTIVES

E23.5.1 Read a meter.

E23.5.2 Determine applicable rate schedule.

E23.5.3 Calculate cost using rate schedule.

E23.5.4 Apply fuel adjustment clause.

E23.5.5 Compute energy cost of new equipment.

E23.5.6 Determine cost of special rates.

E23.5.7 Determine monthly cost.

CRITERION-REFERENCED MEASURE

C23.5 Electrical energy cost determined within 15% of that obtained by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review principles of reading a pointer type meter (E23.5.1).
2. Have students secure rate schedules from power supplies and determine which one applies to their situation (E23.5.2).
3. Have students practice computing cost of electricity for different situations, including home cost (E23.5.3-E23.5.7).

SELECTED TOOLS AND MATERIALS

Power supplies bills
Rate schedule

SELECTED AUDIOVISUAL MATERIALS

Slides or filmstrip: Determining Amount Used and Cost of Electrical Energy. AAVIM.

SELECTED REFERENCES

Understanding Electricity and Electrical Terms. AAVIM.

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DUTY AREA

23. USING ELECTRICITY

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

23.6 Distinguish between parallel and series circuits

COURSE

Agricultural Science and Mechanics II (8008)

23.6

PERFORMANCE OBJECTIVE

P23.6 Given a parallel and a series circuit, distinguish with 100% accuracy which is parallel and which is series.

SELECTED ENABLING OBJECTIVES

E23.6.1 Define circuit.

E23.6.2 Explain the characteristics of parallel and series circuits.

E23.6.3 Read a wiring diagram showing a parallel and a series circuit.

E23.6.4 Diagram a parallel and a series circuit.

CRITERION-REFERENCED MEASURE

C23. Parallel and series circuits distinguished with 100% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review terms to be used with the aid of the Electrical Teaching Center (E23.6.1).
2. Demonstrate the use of parallel and series circuits (E23.6.2).
3. Have students practice reading wiring diagrams and diagram parallel and series circuits (E23.6.3).
4. Have students identify parallel and series circuits at home (E23.6.3, 23.6.4).

SELECTED TOOLS AND MATERIALS

Electrical Teaching Center
Wiring diagram -- parallel and series

SELECTED AUDIOVISUAL MATERIALS

Slides or filmstrip: Electrical Wiring. AAVIM.

SELECTED REFERENCES

Practical Electrical Wiring, Chapter 4. Richter and Schwan

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DUTY AREA

23. USING ELECTRICITY

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

23.7 Identify electrical tools, equipment, and supplies

COURSE

Agricultural Science and Mechanics II (8008)

23.7

PERFORMANCE OBJECTIVE

P23.7 Given a selection of electrical tools, equipment and supplies, identify with 85% accuracy the tools, equipment, and supplies.

SELECTED ENABLING OBJECTIVES

E23.7.1 Select tools, equipment, and supplies used in electrical work.

E23.7.2 Give the proper names of all tools, equipment, and supplies.

E23.7.3 Describe the uses and functions of electrical tools, equipment, and supplies.

E23.7.4 Name the parts of each tool and each piece of equipment.

CRITERION-REFERENCED MEASURE

C23.7 Electrical tools, equipment, and supplies identified with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate the uses and functions of electrical tools, equipment, and supplies (E23.7.1-E23.7.4).

2. Have students use references to identify the names of electrical tools, equipment, and supplies (E23.7.1).

3. Have students prepare a list of electrical tools, equipment, and supplies available at home (E23.7.2).

4. Test students' ability to identify tools, equipment, and supplies after using same (E23.7.1-E23.7.4).

SELECTED TOOLS AND MATERIALS

Screwdriver
Lineman's pliers
Locking pliers
Diagonal cutters
Long nose pliers
Round nose pliers
Water pump pliers
Wire strippers
Adjustable wrenches
Pipe wrenches
Portable electric drill
Brace
Bits (wood, metal, masonry)
Folding extension rule
Measuring tape
Level
Plumb bob
Pocket knife
Crosscut saws
Compass saw
Hacksaw
Wood chisels
Saber saw
Hammer
Soldering iron
Fish tape
Volt-ohm meter
Crimping tool
Electrician's tool pouch
Neon test light
Awl
Tap tools
Electrical boxes (all types)
Switches (all types)
Sockets (light)
Covers (all types)
Wall plates (all types)
Supports
Anchors
Screws

SELECTED AUDIOVISUAL MATERIALS

Transparency masters: Pouch Tools, TM1. Mid-America Vocational Curriculum Consortium.
Specialty Tools, TM2. Mid-America Vocational Curriculum Consortium
Equipment, TM1-15. Mid-America Vocational Curriculum Consortium
Slides or filmstrip: Electrical Wiring. AAVIM.

SELECTED REFERENCES

Electrical Wiring. AAVIM.
Electrical Wiring, Student Handbook, Job II. AAVIM.
Practical Electrical Wiring. Richter and Schwan.

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DUTY AREA

23. USING ELECTRICITY

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

23.8 Demonstrate safety in working with electricity

COURSE

Agricultural Science and Mechanics II (8008)

23.8

PERFORMANCE OBJECTIVE

P23.8 Given instructions on working safely with electricity, demonstrate safety in working with electricity. All items on an instructor-prepared checklist must be rated acceptable.

SELECTED ENABLING OBJECTIVES

E23.8.1 Identify safety rules and practices to follow.

E23.8.2 Name major causes of electrical accidents.

E23.8.3 Pass a safety test (100%).

E23.8.4 Recognize unsafe and hazardous situations and report them to the instructor.

CRITERION-REFERENCED MEASURE

C23.8 Safety in working with electricity demonstrated, with all items on an instructor-prepared checklist rated acceptable.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students read resource materials on electrical safety and identify the practices to follow when working with electricity (E23.8.1-E23.8.4).
2. Have students make a list of safety practices to follow (E23.8.1-E23.8.4).
3. Emphasize safety when demonstrating on the Electrical Teaching Center (E23.8.1-E23.8.4).
4. Present information on what has happened when safe practices have not been followed (E23.8.1-E23.8.4).
5. Have each student score 100% on a safety test covering electricity (E23.8.3).
6. Have students report unsafe and hazardous situations as they occur (E23.8.4).

SELECTED TOOLS AND MATERIALS

Electrical safety test
Instructor-prepared checklist

SELECTED AUDIOVISUAL MATERIALS

Slides or filmstrip: Electrical Wiring. AAVIM.

SELECTED REFERENCES

Occupational Safety and Health in Vocational Education, pp. 172-173. Godbey.
Residential Wiring, R-37-A. Mid-America Vocational Curriculum Consortium.
Shop Safety Skills: Teacher Guide. AAVIM.

DUTY AREA

23. USING ELECTRICITY

TASK/COMPETENCY

23.9 Splice electrical wires

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

23.9

PERFORMANCE OBJECTIVE

P23.9 Given wire and necessary hand tools, splice electrical wire (western union, pigtail, and top) to conform to National Electrical Code, Articles 110-14.

SELECTED ENABLING OBJECTIVES

E23.9.1 Identify electrical tools, equipment, and supplies.

E23.9.2 Demonstrate safety in working with electricity.

E23.9.3 Determine size of wire.

E23.9.4 Remove insulation.

E23.9.5 Make western union splice.

E23.9.6 Make pigtail splice.

E23.9.7 Make tap splice.

E23.9.8 Solder the splice.

E23.9.9 Test splice joint.

E23.9.10 Tape or insulate connection.

CRITERION-REFERENCED MEASURE

C23.9 Electrical wire spliced, meeting National Electrical Code, Articles 110-14.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display tools to be used and have students identify tools by correct name (E23.9.1).
2. Have students complete an electrical safety test with 100% accuracy (E23.9.2).
3. Demonstrate the correct techniques of splicing and have students practice (E23.9.3-E23.9.10).
4. Have students splice wires in connection with SOEPs (E23.9.5-E23.9.10).

SELECTED TOOLS AND MATERIALS

Wire stripper
Electrical wire
Soldering gun or iron
Pliers
Solder
Tape, electrical

SELECTED AUDIOVISUAL MATERIALS

Slides or filmstrips: Electrical Wiring. AAVIM.

SELECTED REFERENCES

Electrical Wiring. AAVIM.
Practical Electrical Wiring, Chapter 8. Richter and Schwan.
Student Farm Shop Manual. Pynnonen.

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DUTY AREA

23. USING ELECTRICITY

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

23.10 Connect wires with solderless connectors

COURSE

Agricultural Science and Mechanics II (8008)

23.10

PERFORMANCE OBJECTIVE

P23.10 Given wire, terminals, connectors, lugs, and necessary hand tools, connect wires to conform to National Electrical Code, Articles 110-14.

SELECTED ENABLING OBJECTIVES

E23.10.1 Identify electrical tools, equipment, and supplies.

E23.10.2 Demonstrate safety in working with electricity.

E23.10.3 Determine size of wire.

E23.10.4 Remove insulation.

E23.10.5 Connect wires with terminals.

E23.10.6 Connect wires with connectors.

E23.10.7 Connect lugs with lugs.

E23.10.8 Test connection.

E23.10.9 Tape or insulate connection, if necessary.

CRITERION-REFERENCED MEASURE

C23.10 Wires connected with terminals, connectors, and lugs to conform to National Electrical Code, Articles 110-14.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display tools to be used and have students identify tools by correct name (E23.10.1).
2. Have students complete an electrical safety test with 100% accuracy (E23.10.2).
3. Demonstrate the correct techniques for connecting wires with solderless connectors (E23.10.3-E23.10.9).
4. Have students practice making connections (E23.10.3-E23.10.9).

SELECTED TOOLS AND MATERIALS

Electrical wire
Wire stripper
Pliers
Solderless connectors
Electrical tape

SELECTED AUDIOVISUAL MATERIALS

Slides or filmstrips: Electrical Wiring. AAVIM.

SELECTED REFERENCES

Electrical Wiring. AAVIM.
Electrical Wiring, Student Workbook. AAVIM.
Practical Electrical Wiring, Chapter 8. Richter and Schwan.

DUTY AREA

23. USING ELECTRICITY

TASK/COMPETENCY

23.11 Install electrical apparatus (switches, receptacles, fixtures, and finish plates)

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

23.11

PERFORMANCE OBJECTIVE

P23.11 Given the necessary tools, equipment, supplies, and an installation ready to finish, install electrical apparatus. Connections must meet code requirements and finish plates must be secure and plumb.

SELECTED ENABLING OBJECTIVES

E23.11.1 Identify electrical tools, equipment, and supplies.

E23.11.2 Demonstrate safety in working with electricity.

E23.11.3 Identify single-pole, three-way, and four-way switches.

E23.11.4 Make screw terminal connections.

E23.11.5 Diagram various switching circuits.

E23.11.6 Wire single-pole, three-way, and four-way switches.

E23.11.7 Install receptacles.

E23.11.8 Install fixtures.

E23.11.9 Install finish plates.

E23.11.10 Test for correct operation.

CRITERION-REFERENCED MEASURE

C23.11 Electrical apparatus installed, meeting code requirements, with finish plates secure and plumb.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display items to be used and have students correctly name each item (E23.11.1-E23.11.3).
2. Have students complete an electrical safety test with 100% accuracy (E23.11.2).
3. Demonstrate the correct procedures in installing apparatus (E23.11.4-E23.11.10).
4. Have students practice installing apparatus by using job sheets (E23.11.4-E23.11.10).
5. Have students install apparatus as part of the SOEPs (E23.11.4-E23.11.10).

SELECTED TOOLS AND MATERIALS

Job sheets: Residential Wiring (various operations). Mid-America Vocational Curriculum Consortium.
Electrical tools
Various switches, receptacles, fixtures, and finish plates.

SELECTED AUDIOVISUAL MATERIALS

Filmstrips: Installing Receptacles and Switches. DCA Educational Productions.
Wiring a Three-Way Switch. DCA Educational Productions.
Transparencies: Residential Wiring (various transparencies). Mid-America Vocational Curriculum Consortium.
Electrical Wiring (various transparencies). Mid-America Vocational Curriculum Consortium.

SELECTED REFERENCES

Electrical Wiring. AAVIM.
Practical Electrical Wiring, Chapters 8-11. Richter and Schwan.

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DUTY AREA

23. USING ELECTRICITY

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

23.12 Repair an appliance cord

COURSE

Agricultural Science and Mechanics II (8008)

23.12

PERFORMANCE OBJECTIVE

P23.12 Given an appliance with a damaged cord and the necessary materials, equipment, and supplies, repair the appliance cord. Cord must be of correct size and type and repair must meet requirements of the National Electrical Code, Articles 400-7-8-9.

SELECTED ENABLING OBJECTIVES

E23.12.1 Identify electrical tools, equipment, and supplies.

E23.12.2 Demonstrate safety in working with electricity.

E23.12.3 Determine kind of cord to use.

E23.12.4 Disconnect old cord from appliance.

E23.12.5 Connect new cord to appliance.

E23.12.6 Test for correct operation.

CRITERION-REFERENCED MEASURE

C23.12 Appliance cord repaired, meeting requirements of the National Electrical Code, Articles 400-7-8-9.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display and have students correctly name each item to be used (E23.12.1).
2. Have students complete an electrical safety test with 100% accuracy (E23.12.2).
3. Demonstrate and have students practice repairing appliance cords (E23.12.3-E23.12.6).
4. Have students repair damaged and frayed appliance cords at home (E23.12.3-E23.12.6).

SELECTED TOOLS AND MATERIALS

Electrical tools
Damaged/frayed appliance cords

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Maintaining the Lighting and Wiring System. AAVIM.

DUTY AREA

23. USING ELECTRICITY

TASK/COMPETENCY

23.13 Construct an approved electrical project

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

23.13

PERFORMANCE OBJECTIVE

P23.13 Given an assignment to construct an electrical project and access to the needed tools, equipment, and supplies, construct an approved electrical project. Project plans must be approved by the instructor and completed project must conform to the plans and specifications.

SELECTED ENABLING OBJECTIVES

E23.13.1 Select or draw a plan.

E23.13.2 Identify electrical symbols.

E23.13.3 Estimate materials needed for the project.

E23.13.4 Estimate the time and cost to complete the project.

E23.13.5 Describe the types of skills needed.

E23.13.6 Identify safety practices to follow.

E23.13.7 Evaluate the quality of work done.

E23.13.8 Demonstrate safety in working with electricity.

CRITERION-REFERENCED MEASURE

C23.13 Instructor-approved electrical project constructed, conforming to plans and specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies for agricultural mechanics (E23.13.1, E23.13.2).
2. Have students estimate the time, materials, and cost to complete the project (E23.13.3-E23.13.5).
3. Have students describe procedures to follow (E23.13.5-E23.13.8).
4. Verify that students have obtained 100% on a safety test on using electricity (E23.13.1-E23.13.8).
5. Plan approved projects that can be used in SOEPs (E23.13.1-E23.13.8).
6. Observe and provide assistance when needed (E23.13.1-E23.13.8).

SELECTED TOOLS AND MATERIALS

Electrical project plans
Electrical tools, equipment, and supplies
Lumber as required by plans

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Agricultural Mechanics Plans. Hobar.

DUTY AREA

23. USING ELECTRICITY

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

23.14 Clean and lubricate an electric motor

COURSE

Agricultural Science and Mechanics II (8008)

23.14

PERFORMANCE OBJECTIVE

P23.14 Given an electric motor, instruction on cleaning and lubrication, and the necessary supplies, clean and lubricate the electric motor. Motor must be clean and lubricated with correct oil or grease, according to specifications in the operator's manual.

SELECTED ENABLING OBJECTIVES

E23.14.1 Disconnect motor from power.

E23.14.2 Remove protective covers as required.

E23.14.3 Clean motor of all foreign materials (dust, straw, lint, etc.).

E23.14.4 Determine type of bearings.

E23.14.5 Identify types and uses of oil.

E23.14.6 Identify types and uses of grease.

E23.14.7 Lubricate sleeve bearings.

E23.14.8 Lubricate ball bearings.

E23.14.9 Replace protective covers.

CRITERION-REFERENCED MEASURE

C23.14 Electric motor cleaned and lubricated using correct lubricant according to specifications in the operator's manual.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate and have students practice cleaning electric motors (E23.14.1-E23.14.3, E23.14.9).
2. Display types of bearings, and have students identify them (E23.14.4).
3. Demonstrate the uses of oil and grease, and have students identify types of grease and oil (E23.14.5, E23.14.6).
4. Have students practice lubricating bearings (E23.15.7, E23.14.8).
5. Have students apply what is learned to their SOEPs (E23.14.1-E23.14.9).

SELECTED TOOLS AND MATERIALS

Solvent
Oil
Grease
Operator's manual

SELECTED AUDIOVISUAL MATERIALS

Transparency masters: Electric Motors. AAVIM.

SELECTED REFERENCES

Electric Motors, pp. 26-28. AAVIM.
Fuels and Lubricants. AAVIM.

DUTY AREA

24. PERFORMING GAS WELDING AND CUTTING OPERATIONS

TASKS/COMPETENCIES

24.1 Interpret gas welding and cutting plans

24.2 Demonstrate safe use and maintenance of gas welding and cutting equipment

24.3 Select gas welding and cutting tips

24.4 Select gas pressures

24.5 Prepare metal for gas welding and cutting

24.6 Weld stringer bead without filler rod

24.7 Perform fusion welding without filler rod

24.8 Butt weld with filler rod

24.9 Braze weld a butt joint

24.10 Cut metal

24.11 Hardsurface with gas welding equipment

24.12 Weld cast iron

DUTY AREA

24. PERFORMING GAS WELDING AND CUTTING OPERATIONS

TASK/COMPETENCY

24.1 Interpret gas welding and cutting plans

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

24.1

PERFORMANCE OBJECTIVE

P24.1 Given gas welding and cutting plans, interpret the plans by identifying with 90% accuracy the views, dimensions, abbreviations, and symbols used on the plans; identify materials needed, and provide a welding and cutting sequence with 100% accuracy.

SELECTED ENABLING OBJECTIVES

E24.1.1 Identify views, dimensions, abbreviations, and symbols on gas welding and cutting plans.

E24.1.2 Identify materials needed to complete the project.

E24.1.3 Outline a correct gas welding and cutting sequence.

CRITERION-REFERENCED MEASURE

C24.1 Gas welding and cutting plans interpreted identifying with 90% accuracy the views, dimensions, abbreviations, and symbols used, identifying materials needed, and providing a welding and cutting sequence with 100% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies (Duty Area 5) needed in agricultural mechanics (E24.1.1).
2. Define key concepts related to working drawings (E24.1.1).
3. Have students examine samples of gas welding and cutting plans and describe their characteristics and use (E24.1.1).
4. Have students prepare a bill of materials from the plans (E24.1.2).
5. Have experienced students outline a gas welding and cutting sequence (E24.1.3).

SELECTED TOOLS AND MATERIALS

Gas welding plans
Gas cutting plans
Assignment Sheet #1-- Read and Interpret a Drawing, pp. 19F - 22F. Vocational Agriculture II. Oklahoma State Board of Vocational and Technical Education

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Types of Dimensions of a Drawing, p. 11F, Vocational Agriculture II. Oklahoma State Board of Vocational and Technical Education.
Basic Welding Symbols, p. 17F, Vocational Agriculture II. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Blueprint Reading for Welders: Instructor's Guide (wall charts, and transparencies). Hobar.
Modern Agricultural Mechanics, pp. 21-23. Wakeman.
Vocational Agriculture II--A Curriculum Guide, Section F, Unit I. Oklahoma State Board of Vocational and Technical Education.

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DUTY AREA

24. PERFORMING GAS WELDING AND CUTTING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

24.2 Demonstrate safe use and maintenance of gas welding and cutting equipment

COURSE

Agricultural Science and Mechanics II (8008)

24.2

PERFORMANCE OBJECTIVE

P24.2 Given gas welding and cutting equipment, tools, and supplies, demonstrate safe use and maintenance by following all safety procedures and performing maintenance specified by the instructor.

SELECTED ENABLING OBJECTIVES

E24.2.1 Identify tools, equipment, and supplies.

E24.2.2 Identify safety rules and equipment applicable to gas welding and cutting.

E24.2.3 Pass a safety test on gas welding and cutting.

E24.2.4 Set up equipment.

E24.2.5 Inspect for damage.

E24.2.6 Perform soap and water and/or submerged leak test.

E24.2.7 Recognize unsafe and hazardous situations that occur and report to the instructor.

E24.2.8 Shut down equipment.

CRITERION-REFERENCED MEASURE

C24.2 Safe use and maintenance of gas welding and cutting equipment demonstrated by following all safety procedures and performing maintenance as specified by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students use references to identify safety rules and equipment for gas welding and cutting (E24.2.1-E24.2.3).
2. Emphasize safety when demonstrating and presenting material on gas welding and cutting (E24.2.1-E24.2.8).
3. Have each student pass a test on safety and operation of gas welding and cutting equipment (E24.2.3).
4. Present information on what has happened when safe practices have not been followed (E24.2.1-E24.2.3).
5. Have students prepare equipment for operation and shut it down correctly (E24.2.4-E24.2.8).

SELECTED TOOLS AND MATERIALS

Gas welding and cutting equipment
Soap and water
Protective clothing and equipment

SELECTED AUDIOVISUAL MATERIALS

Filmstrips: Setup and Safety, Parts 1 and 2. Hobar.
Getting Ready for Flame Cutting. Hobar.
Filmstrip/cassette: Welding--Oxyacetylene Welding. Bergwall Productions, Inc.

SELECTED REFERENCES

Laboratory Safety Handbook. Virginia Department of Education.
Modern Agricultural Mechanics, Chapter 8. Wakeman.
Occupational Safety and Health in Vocational Education, pp. 142-146. Godbey.

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DUTY AREA

24. PERFORMING GAS WELDING AND CUTTING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

24.3 Select gas welding and cutting tips

COURSE

Agricultural Science and Mechanics II (8008)

24.3

PERFORMANCE OBJECTIVE

P24.3 Given several gas welding and cutting exercises with various thicknesses of metal, select gas welding and cutting tips. Tips selected must conform to those recommended by the manufacturer.

SELECTED ENABLING OBJECTIVES

E24.3.1 Measure thickness of metal.

E24.3.2 Locate the tip size designation on the tip.

E24.3.3 Determine the tip size recommended for given thickness of metal.

CRITERION-REFERENCED MEASURE

C24.3 Gas welding and cutting tips selected, conforming to manufacturer's recommendations.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Provide students with specifications of several gas welding and cutting exercises, and have them use references or manufacturer's recommendations to determine the size tips to select (E24.3.1-E24.3.3).

2. Have students practice measuring thicknesses of metal (E24.3.1).

SELECTED TOOLS AND MATERIALS

Several gas welding and cutting exercises requiring various thicknesses of metal
Manufacturer's recommendations on tip sizes
Steel rule

SELECTED AUDIOVISUAL MATERIALS

Slides: Setting up and Cutting with Oxyacetylene Equipment. NASCO.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 8. Wakeman.
Oxyacetylene Welding, Cutting and Brazing, Topic 3. Hobar.

DUTY AREA

24. PERFORMING GAS WELDING AND CUTTING OPERATIONS

TASK/COMPETENCY

24.4 Select gas pressures

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

24.4

PERFORMANCE OBJECTIVE

P24.4 Given the correct equipment (including the correct tip size) and supplies for a gas welding or cutting exercise, select gas pressures. Pressures selected must supply adequate oxygen and acetylene to perform the exercise.

SELECTED ENABLING OBJECTIVES

E24.4.1 Identify tools, equipment, and supplies.

E24.4.2 Identify safety rules and equipment.

E24.4.3 Set up equipment.

E24.4.4 Select gas welding and cutting tips.

E24.4.5 Light torch.

E24.4.6 Demonstrate the maximum amount of acetylene pressure for a given welding or cutting tip.

E24.4.7 Adjust flame.

E24.4.8 Adjust pressure as needed.

E24.4.9 Turn off torch.

E24.4.10 Shut down equipment.

CRITERION-REFERENCED MEASURE

C24.4 Gas pressures selected, adequate to perform the exercise.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have student set up equipment according to manufacturer's recommendations (E24.4.2-E24.4.4).
2. Demonstrate how to adjust pressure for maximum amounts of gas (E24.4.5-E24.5.10).
3. Have students practice adjusting flame as needed (E24.4.1-E24.4.10).

SELECTED TOOLS AND MATERIALS

Gas welding and cutting equipment
Protective clothing and equipment

SELECTED AUDIOVISUAL MATERIALS

Slides: Setting up and Cutting with Oxyacetylene Equipment. NASCO.
Filmstrip: Oxyacetylene Welding. DCA.

SELECTED REFERENCES

Modern Agricultural Mechanics, p. 199. Wakeman.

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DUTY AREA

24. PERFORMING GAS WELDING AND CUTTING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

24.5 Prepare metal for gas welding and cutting

COURSE

Agricultural Science and Mechanics II (8008)

24.5

PERFORMANCE OBJECTIVE

P24.5 Given a gas welding or cutting exercise, prepare the metal. The metal must be free from slag, scale, rust, grease, and paint. Joints over 1/8" thick must be beveled.

SELECTED ENABLING OBJECTIVES

E24.5.1 Identify safety practices to follow.

E24.5.2 Identify and remove slag, scale, rust, grease, and paint.

E24.5.3 Bevel initial joints over 1/8" thick (for welding).

E24.5.4 Place or clamp metal in position.

E24.5.5 Identify types of joints for welding.

CRITERION-REFERENCED MEASURE

C24.5. Metal prepared for gas welding and cutting by removing slag, scale, rust, grease, and paint and beveling joints over 1/8" thick.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate what happens when metal is not clean (E24.5.2).
2. Demonstrate how to remove slag, scale, rust, grease, and paint safely (E24.4.1, E24.4.2).
3. Explain the purpose of beveling metal. Demonstrate what happens when thick metal is not beveled (E24.4.3).
4. Have students clean, bevel, and place metal in position for welding and cutting (E24.4.4, E24.4.5).
5. Have students identify the different types of joints (E24.4.5).

SELECTED TOOLS AND MATERIALS

Gas welding and cutting equipment
Examples of welding joints
Grinder
Wire brush
Scraper
Solvent
Steel rule
Protective equipment
Pliers or tongs

SELECTED AUDIOVISUAL MATERIALS

Slides: Setting up and Cutting with Oxyacetylene Equipment. NASCO.
Filmstrip: Oxyacetylene Welding. DCA.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 8. Wakeman.

DUTY AREA

24. PERFORMING GAS WELDING AND CUTTING OPERATIONS

TASK/COMPETENCY

24.6 Weld stringer bead without filler rod

Application

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

24.6

PERFORMANCE OBJECTIVE

P24.6	Given 11-gauge mild steel and gas welding equipment, weld a stringer bead without filler rod. Finished weld bead should be flat and 3/8" wide.

SELECTED ENABLING OBJECTIVES

E24.6.1	Identify safety practices to follow.
E24.6.2	Describe and identify qualities of a good fusion weld.
E24.6.3	Clean and prepare metal.
E24.6.4	Select welding tip.
E24.6.5	Light torch, and adjust flame.
E24.6.6	Weld stringer bead.
E24.6.7	Clean and evaluate weld.

CRITERION-REFERENCED MEASURE

C24.6.	Stringer bead welded without filler rod, head flat and 3/8" wide.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate and have students run stringer beads on 11-gauge mild steel (E24.6.1-E24.6.7).

2. Display exercises or examples of good and poor welds (E24.6.2).

SELECTED TOOLS AND MATERIALS

Gas welding equipment
Protective equipment
11-gauge mild steel
Steel rule

SELECTED AUDIOVISUAL MATERIALS

Filmstrips: Oxyacetylene Welding. Hobar.

SELECTED REFERENCES

Oxyacetylene Welding, Cutting and Brazing, Topic 4. Hobar.

DUTY AREA

24. PERFORMING GAS WELDING AND CUTTING OPERATIONS

TASK/COMPETENCY

24.7 Perform fusion welding without filler rod

-----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

24.7

PERFORMANCE OBJECTIVE

P24.7 Given two strips of 16-gauge 1¼" x 6" mild steel and gas welding equipment, perform fusion welding without filler rod. Fusion weld must have proper bond with smooth, even puddles without holes, craters, or undercut.

SELECTED ENABLING OBJECTIVES

E24.7.1 Identify safety practices to follow.

E24.7.2 Describe and identify qualities of a good fusion weld.

E24.7.3 Clean and prepare metal.

E24.7.4 Select welding tip.

E24.7.5 Light torch and adjust flame.

E24.7.6 Tack metal.

E24.7.7 Fuse weld.

E24.7.8 Clean and evaluate weld.

CRITERION-REFERENCED MEASURE

C24.7 Fusion welding without filler rod performed, weld having proper bond with smooth, even puddles without holes, craters, or undercut.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate and have students fuse 16-gauge 1¼" x 6" mild steel without a filler rod (E24.7.1-E24.7.8).
2. Display exercises or examples of good and poor beads (E24.7.2).

SELECTED TOOLS AND MATERIALS

Gas welding equipment
Protective equipment
16-gauge mild steel

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Oxyacetylene Welding. Hobar.
Transparencies: Oxyacetylene Fusion Welding Flames, TM 4, p. 101F, Vocational Agriculture II. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 8. Wakeman.
Vocational Agriculture II--A Curriculum Guide, Section F, Unit III. Oklahoma State Board of Vocational and Technical Education.

DUTY AREA

24. PERFORMING GAS WELDING AND CUTTING OPERATIONS

TASK/COMPETENCY

24.8 Butt weld with filler rod

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

24.8

PERFORMANCE OBJECTIVE

P24.8 Given two strips of 16-gauge 1¼" x 6" mild steel and gas welding equipment, butt weld with filler rod. Weld must have even beads and proper bond with smooth, even puddles without holes, craters, or undercut.

SELECTED ENABLING OBJECTIVES

E24.8.1 Identify safety practices to follow.

E24.8.2 Describe and identify qualities of a good fusion weld.

E24.8.3 Clean and prepare metal.

E24.8.4 Select filler rod.

E24.8.5 Select welding tip.

E24.8.6 Light torch and adjust flame.

E24.8.7 Tack metal.

E24.8.8. Weld with filler rod.

E24.8.9 Clean and evaluate weld.

CRITERION-REFERENCED MEASURE

C24.8 Butt weld with filler rod performed, weld having even beads and proper bond with smooth, even puddles without holes, craters, or undercut.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display examples of good and poor beads made with filler rods (E24.8.2, E24.8.9).
2. Demonstrate and have students perform butt, single-vee, and double-vee butt welds with steel rods (E24.8.1-E24.8.9).

SELECTED TOOLS AND MATERIALS

Gas welding equipment
Protective equipment
Steel rods
3/16" mild steel

SELECTED AUDIOVISUAL MATERIALS

Slides: Oxyacetylene Welding and Cutting for Beginners. NASCO.

5

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 8. Wakeman.
Vocational Agriculture II--A Curriculum Guide, Section F, Unit III. Oklahoma State Board of Vocational and Technical Education.

-----------------Application--------------

DUTY AREA

24. PERFORM GAS WELDING AND CUTTING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

24.9 Braze weld a butt joint

COURSE

Agricultural Science and Mechanics II (8008)

24.9

PERFORMANCE OBJECTIVE

P24.9 Given two strips of 3/16" x 1" x 3" mild steel and gas welding equipment, perform braze welding. Weld bead must be even and have proper bond with smooth, even puddles without holes, craters, or undercut.

SELECTED ENABLING OBJECTIVES

E24.9.1	Identify safety practices to follow.
E24.9.2	Describe and identify qualities of a good braze weld.
E24.9.3	Clean and prepare metal.
E24.9.4	Select bronze rod and flux.
E24.9.5	Select welding tip.
E24.9.6	Light torch and adjust flame.
E24.9.7	Tack weld.
E24.9.8	Tin joint.
E24.9.9	Weld with bronze rod.
E24.9.10	Clean and evaluate weld.

CRITERION-REFERENCED MEASURE

C24.9 Butt joint braze welded, bead even and having proper bond with smooth, even puddles without holes, craters, or undercut.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display examples of good braze welds (E24.9.2, E24.9.10).
2. Demonstrate and have students practice braze welding butt joints (E24.9.1-E24.9.10).

SELECTED TOOLS AND MATERIALS

Gas welding equipment
Protective equipment
Bronze rods
3/16" x 1" x 3" mild steel

SELECTED AUDIOVISUAL MATERIALS

Transparency: Braze Welding a Butt Joint, p. 129F, Vocational Agriculture II. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 8. Wakeman.
Vocational Agriculture II--A Curriculum Guide, Section F, Unit IV. Oklahoma State Board of Vocational and Technical Education.

DUTY AREA

24. PERFORM GAS WELDING AND CUTTING OPERATIONS

TASK/COMPETENCY

24.10 Cut metal

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

24.10

PERFORMANCE OBJECTIVE

P24.10 Given oxyacetylene equipment and carbon steel, cut metal. Cut must be smooth with square shoulders and no attached slag. Cut must meet a tolerance of ±3/32 inch.

SELECTED ENABLING OBJECTIVES

E24.10.1 Identify safety practices to follow.

E24.10.2 Define terms associated with oxyacetylene cutting.

E24.10.3 Describe and identify qualities of correct cuts.

E24.10.4 Explain the chemistry of gas cutting.

E24.10.5 Measure and mark with soapstone.

E24.10.6 Select cutting tips.

E24.10.7 Set pressure.

E24.10.8 Light torch and adjust flame.

E24.10.9 Cut prescribed pattern.

E24.10.10 Clean and evaluate cut.

CRITERION-REFERENCED MEASURE

C24.10 Metal cut, cut smooth with square shoulders and no slag attached, meeting a tolerance of ±3/32 inch.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display examples of good and poor cuts made with the torch (E24.10.1-E24.10.10).
2. Have students pass a safety test on cutting (E24.10.1-E24.10.4).
3. Demonstrate and have students perform cutting operations (E24.10.5-E24.10.10).

SELECTED TOOLS AND MATERIALS

Examples of metal cut with a torch
Soapstone
Oxyacetylene cutting equipment

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Oxyacetylene Welding, Unit 4. DCA Educational Products.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 8. Wakeman.
Oxyacetylene Welding, Cutting and Brazing, Topics 14-15. Hobar.

DUTY AREA

24. PERFORMING GAS WELDING AND CUTTING OPERATIONS

TASK/COMPETENCY

24.11 Hardsurface with gas welding equipment

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

24.11

PERFORMANCE OBJECTIVE

P24.11 Given gas welding equipment, metal plate, and filler metal, hardsurface with gas welding equipment. Hardsurfacing must be even and have proper bond without holes, craters, or cracks in the metal.

SELECTED ENABLING OBJECTIVES

E24.11.1 Identify safety practices to follow.

E24.11.2 Define terms associated with hardsurfacing.

E24.11.3 Select hardsurface rod.

E24.11.4 Identify procedures to follow with selected rod.

E24.11.5 Clean and prepare metal.

E24.11.6 Select welding tip.

E24.11.7 Light torch and adjust flame.

E24.11.8 Preheat metal.

E24.11.9 Apply hardsurface.

E24.11.10 Cool as specified by manufacturer.

E24.11.11 Clean and evaluate.

CRITERION-REFERENCED MEASURE

C24.11 Hardsurfacing performed, even application with proper bond and without holes, craters, or cracks in the metal.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display examples of hardsurfaced equipment parts (E24.11.1-E24.11.11).
2. Explain and demonstrate the process of hardsurfacing (E24.11.1-E24.11.11).
3. Have students practice (E24.11.3-E24.11.11).
4. Have students perform a survey of items that can be hardsurfaced and bring in items to hardsurface (E24.11.3-E24.11.11).

SELECTED TOOLS AND MATERIALS

Gas welding equipment
Protective equipment
Hardsurface rods
Metal plate
Examples of hardsurfacing

SELECTED AUDIOVISUAL MATERIALS

Filmstrips: Oxyacetylene Hardsurfacing Techniques for Agriculture. Hobar.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 8. Wakeman.
Oxyacetylene Welding, Cutting and Brazing, Topic 31. Hobar.

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DUTY AREA

24. PERFORMING GAS WELDING AND CUTTING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

24.12 Weld cast iron

COURSE

Agricultural Science and Mechanics II (8008)

24.12

PERFORMANCE OBJECTIVE

P24.12 Given gas welding equipment and cast iron, weld cast iron. Weld bead must be even and have proper bond with smooth even puddles without holes, craters, or undercut.

SELECTED ENABLING OBJECTIVES

E24.12.1 Identify safety practices to follow.

E24.12.2 Identify cast iron.

E24.12.3 Clean and prepare metal.

E24.12.4 Select rod and flux.

E24.12.5 Select welding tip.

E24.12.6 Light torch and adjust flame.

E24.12.7 Preheat metal.

E24.12.8 Tack weld.

E24.12.9 Tin joint.

E24.12.10 Weld with bronze rod.

E24.12.11 Cool metal.

E24.12.12 Clean and evaluate weld.

CRITERION-REFERENCED MEASURE

C24.12 Cast iron welded, bead even and having proper bond with smooth even puddles without holes, craters, or undercut.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display examples of welded cast iron (E24.12.1-E24.12.12).
2. Demonstrate and have students practice welding cast iron (E24.12.1-E24.12.12).
3. Have students perform a survey of items that are made of cast iron (E24.12.2).

SELECTED TOOLS AND MATERIALS

Gas welding equipment
Protective equipment
Bronze rods
1/2" cast iron
Examples of welded cast iron

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 8. Wakeman.
Oxyacetylene Welding, Cutting and Brazing, Topic 31. Hobar.

DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

TASKS/COMPETENCIES

25.1 Identify parts and components of small gasoline engines

25.2 Explain how small gasoline engines work

25.3 Compare the operation of four-stroke cycle and two-stroke cycle engines

25.4 Use operator's manual

25.5 Use precision measuring equipment

25.6 Service and maintain fuel system of small gasoline engine

25.7 Service and maintain air system of small gasoline engine

27.8 Service lubrication system of small gasoline engine

27.9 Service and adjust carburetor of small gasoline engine

27.10 Service and maintain ignition system of small gasoline engine

27.11 Service manual controls of small gasoline engine

27.12 Troubleshoot a small gasoline engine

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DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

25.1 Identify parts and components of small gasoline engines

COURSE

Agricultural Science and Mechanics II (8008)

25.1

PERFORMANCE OBJECTIVE

P25.1 Given a small gasoline engine, identify the parts and components with 90% accuracy on a written or oral test.

SELECTED ENABLING OBJECTIVES

E25.1.1 Define terms associated with small gasoline engines.

E25.1.2 Locate parts and components on small engines.

E25.1.3 Identify distinguishing features.

E25.1.4 Describe the functions of parts and components.

CRITERION-REFERENCED MEASURE

C25.1 Parts and components of small gasoline engines identified with 90% accuracy on a written or oral test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Assemble parts and components on a display board (E25.1.1-E25.1.4).
2. Dismantle a small engine, labeling all parts and components by name and function (E25.1.2-E25.1.4).
3. Have students identify parts by using a parts catalog (E25.1.2).
4. Have students identify parts by using a microfiche reader (E25.1.2).
5. Have students obtain parts from stock room (E25.1.2).

SELECTED TOOLS AND MATERIALS

Small engine display board
Two- and four-cycle small engines

SELECTED AUDIOVISUAL MATERIALS

Transparency: Four-Cycle Engine Cutaway. DCA Educational Products.
Flip Charts: Small Engine. Briggs and Stratton.

SELECTED REFERENCES

Engines, Compact Equipment. John Deere.
Small Gas Engines. Roth and Baird.

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DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

25.2 Explain how small gasoline engines work

COURSE

Agricultural Science and Mechanics II (8008)

25.2

PERFORMANCE OBJECTIVE

P25.2 Given a one-cylinder internal combustion engine, explain how small gasoline engines work. The explanation must agree with accepted theory.

SELECTED ENABLING OBJECTIVES

E25.2.1 Define terms associated with internal combustion engines.

E25.2.2 Identify parts and components of small gasoline engines.

E25.2.3 Describe the function of the carburetor.

E25.2.4 Describe the function of the spark plug.

E25.2.5 Describe the function of the valves.

E25.2.6 Describe the function of the points.

E25.2.7 Describe the function of the magnets.

E25.2.8 Describe how small gas engines are cooled.

E25.2.9 Explain the four principal events that take place in small gas engines.

CRITERION-REFERENCED MEASURE

C25.2 Working of small gasoline engines explained according to accepted theory.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display a cutaway model, diagrams, and/or actual two- and four-cycle gasoline engines (E25.2.1, E25.2.2).

2. Dismantle a small engine, labeling all parts by name and function (E25.2.2-E25.2.9).

SELECTED TOOLS AND MATERIALS

Four-stroke engine
Two-stroke engine
Cutaway engines
Engine diagrams
Small engine wrenches
Labels
Skill sheets--Hobar

SELECTED AUDIOVISUAL MATERIALS

Flip Charts: Small Engines. Briggs and Stratton.
Transparencies: Four-Cycle Engine Cutaway. DCA Educational Products.

SELECTED REFERENCES

Engines, Compact Equipment, Chapters 1-2. John Deere.
Small Engines, Vol. 1. AAVIM.
Small Engines, Vol. 1, Student Workbook. AAVIM.
Small Gas Engines, Chapters 1-2. Roth and Baird.

DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

TASK/COMPETENCY

25.3 Compare the operation of four-stroke cycle and two-stroke cycle engines

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

25.3

PERFORMANCE OBJECTIVE

P25.3 Given an overview of small engine operation, compare the operation of four-stroke and two-stroke cycle engines. The comparison must include two of the four principal methods used in determining types of small engines.

SELECTED ENABLING OBJECTIVES

E25.3.1 Define terms associated with internal combustion engines.

E25.3.2 Identify parts and components of small gasoline engines.

E25.3.3 Explain the four principal events that take place in small gas engines.

E25.3.4 Describe the three primary differences in operation.

E25.3.5 Determine if the engine has an oil filler plug.

E25.3.6 Compare nameplate information.

E25.3.7 Determine if the engine has an exhaust port or muffler.

E25.3.8 Determine if the compression is present at each revolution of the crankshaft or at every other revolution.

CRITERION-REFERENCED MEASURE

C25.3 Operation of four- and two- cycle engines compared , including two of the four principal methods used in determining types of small engines.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display and compare differences in two- and four-cycle engines. Use more than one brand of engine (E25.3.1-E25.3.8).

2. Have students locate the distinguishing characteristics of two- and four-cycle engines (E25.3.4-E25.3.8).

SELECTED TOOLS AND MATERIALS

Four-stroke engines
Two-stroke engines
Small engine wrenches

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Engines, Compact Equipment, Chapters 1-3. John Deere.
Small Engines, Vol. 1. AAVIM.
Small Engines, Vol. 1, Student Workbook. AAVIM.

DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

TASK/COMPETENCY

25.4 Use operator's manual

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

25.4

PERFORMANCE OBJECTIVE

P25.4 Given a worksheet and an operator's manual, use the operator's manual to locate maintenance and service information with 90% accuracy.

SELECTED ENABLING OBJECTIVES

E25.4.1 Locate maintenance information.

E25.4.2 Locate service information.

CRITERION-REFERENCED MEASURE

C25.4 Information in the operator's manual located with 90% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the use of an operator's manual (E25.4.1, E25.4.2).
2. Develop a worksheet for students to use to locate information found in an operator's manual (E25.4.1, E25.4.2).

SELECTED TOOLS AND MATERIALS

Instructor-prepared worksheet
Operator's manuals

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Small Engines, Vol. 1. AAVIM.

DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

TASK/COMPETENCY

25.5 Use precision measuring equipment

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

25.5

PERFORMANCE OBJECTIVE

P25.5 Given an assortment of precision measuring equipment, use it to obtain measurements within ± 2% of those obtained by the instructor.

SELECTED ENABLING OBJECTIVES

E25.5.1 Explain the operation and adjustment.

E25.5.2 Calibrate precision measuring equipment.

E25.5.3 Read calibrations on equipment.

E25.5.4 Obtain measurements.

E25.5.5 Justify approving or rejecting a tolerance.

CRITERION-REFERENCED MEASURE

C25.5 Precision measuring equipment used within ± 2% of the measurements obtained by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review the instructional manual for each tool, and have the students practice using them to determine predetermined measurements (E25.5.1-E25.5.5).

2. Teach students how to use precision measuring equipment as the situation arises (E25.5.1-E25.5.5).

SELECTED TOOLS AND MATERIALS

Micrometer
Verave caliper
Dial caliper
Feeler gauge
Spark plug gauge
Plastigauge
Torque wrench
Dial indicator
Cylinder taper gauge
RPM speed indicator
Reject gauge
Tachometer
Measuring workbook--Hobar

SELECTED AUDIOVISUAL MATERIALS

Slides: Reading the Micrometer (#206). Hobar.
Torque and Torque Wrenches (#302). Hobar.

SELECTED REFERENCES

Fundamental of Service: Shop Tools. John Deere.
Micrometers, Calipers and Gauges (Manual). Hobar.
Operator's manuals
Torque and Torque Wrenches (Manual). Hobar.

----------------Application--------------

DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

25.6 Service and maintain fuel system of small gasoline engine

COURSE

Agricultural Science and Mechanics II (8008)

25.6

PERFORMANCE OBJECTIVE

P25.6	Given a small gasoline engine and necessary tools, maintain the fuel system according to the operator's or service manual.

SELECTED ENABLING OBJECTIVES

E25.6.1	Observe safety precautions in handling gasoline.
E25.6.2	Locate damages, leaks, or obstructions to fuel lines and fuel tank.
E25.6.3	Remove, clean, and reinstall fuel lines and fuel tank.
E25.6.4	Replace shut-off valve on fuel tank.
E25.6.5	Remove, clean, and reinstall fuel filter.
E25.6.6	Select fuel.
E25.6.7	Prepare fuel for 2- cycle engine.
E25.6.8	Fill the fuel tank.

CRITERION-REFERENCED MEASURE

C25.6	Fuel system of small gasoline engine serviced and maintained according to the operator's or service manual.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display several types of fuel systems (E25.6.1-E25.6.5).
2. Have students use service manual in servicing and maintaining the fuel system (E25.6.1-E25.6.5).
3. Prepare fuel systems for students to troubleshoot (E25.6.1-E25.6.5).
4. Have students select and prepare fuel for engines (E25.5.1, E25.5.6-E25.5.8).

SELECTED TOOLS AND MATERIALS

Small engine tools
Regular gasoline
Oil
Service manual
Small engine fuel systems
Fuel containers
Operator's manual
Cleaning solvent

SELECTED AUDIOVISUAL MATERIALS

Transparency masters: Small Engines, Vol. 1. AAVIM.

SELECTED REFERENCES

Engines, Compact Equipment. John Deere.
Small Engines, Vol. 1. AAVIM.
Small Gas Engines, Chapter 3. Roth and Baird.

----------------Application--------------

DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

25.7 Service and maintain air system of small gasoline engine

COURSE

Agricultural Science and Mechanics II (8008)

25.7

PERFORMANCE OBJECTIVE

P25.7 Given a small gasoline engine and necessary tools and equipment, service and maintain the air system according to the operator's or service manual.

SELECTED ENABLING OBJECTIVES

E25.7.1 Identify all safety precautions to follow.

E25.7.2 Explain the importance of the air cleaner.

E25.7.3 Identify the three types of air cleaners.

E25.7.4 Determine when to clean air cleaners.

E25.7.5 Remove, clean, and reinstall air cleaner.

CRITERION-REFERENCED MEASURE

C25.7 Air system of a small engine serviced and maintained according to the operator's or service manual.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display and demonstrate the proper procedures for cleaning air cleaner (E25.7.1-E25.7.5).

2. Have students identify the type of air cleaner found on several small engines (E25.7.3).

3. Have students disassemble, clean, and reinstall the three types of air cleaners (E25.7.5).

SELECTED TOOLS AND MATERIALS

Three types of air cleaners
Screwdrivers
Containers for washing parts
Oil
Clean rags
Wooden scraper
Old paint brush
Petroleum solvent
Service manual

SELECTED AUDIOVISUAL MATERIALS

Transparency masters: Small Engines, Vol. 1. AAVIM.

SELECTED REFERENCES

Service and Repair Instructions. Briggs and Stratton.
Small Engines, Vol. 1. AAVIM.
Small Engines, Vol. 1, Student Workbook. AAVIM.

DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

TASK/COMPETENCY

25.8 Service lubrication system of small gasoline engine

---------------Application---------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

25.8

PERFORMANCE OBJECTIVE

P25.8 Given a small engine and the necessary tools, service the lubrication system according to the operator's or service manual.

SELECTED ENABLING OBJECTIVES

E25.8.1 Identify all safety precautions to follow.

E25.8.2 Describe the types of lubrication systems on small engines.

E25.8.3 Explain the importance of proper lubrication.

E25.8.4 Select the proper crankcase oil.

E25.8.5 Check the crankcase oil.

E25.8.6 Change the crankcase oil.

CRITERION-REFERENCED MEASURE

C25.8 Lubrication system of a small gasoline engine serviced according to the operator's or service manual.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display and demonstrate the operation of several types of lubrication systems (E25.8.1, E25.8.2).

2. Demonstrate friction by first rubbing two sheets of waxed paper together; then rub two sheets of coarse abrasive together. Discuss how a lubricant could reduce friction in each case (E25.8.3).

3. Demonstrate the use of a viscosimeter (E25.8.4).

4. Have students use the service manual when selecting, checking, and changing the crankcase oil (E25.8.4-E25.8.6).

SELECTED TOOLS AND MATERIALS

Small engine tools
Engine oil
Viscosimeter
Coarse abrasive
Wax paper
Several types of lubrication systems
Service manual

SELECTED AUDIOVISUAL MATERIALS

Transparency masters: Small Engines, Vol. 1. AAVIM.

SELECTED REFERENCES

Small Engines, Vol. 1. AAVIM.
Small Engines, Vol. 1, Student Workbook. AAVIM.
Small Gas Engines, Chapter 6. Roth and Baird.

DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

TASK/COMPETENCY

25.9 Service and adjust carburetor of small gasoline engine

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

25.9

PERFORMANCE OBJECTIVE

P25.9 Given a small gasoline engine and the necessary tools, service and adjust the carburetor according to the service manual.

SELECTED ENABLING OBJECTIVES

E25.9.1 Identify types of carburetors.

E25.9.2 Explain the operation of the carburetor.

E25.9.3 Describe the function of the parts of the carburetor.

E25.9.4 Identify wear on moving parts.

E25.9.5 Identify safety practices to follow in servicing and adjusting the carburetor.

E25.9.6 Remove, clean, and reinstall parts of a carburetor.

E25.9.7 Install repair kit.

E25.9.8 Adjust carburetor needle valve.

E25.9.9 Adjust carburetor idle valve.

E25.9.10 Adjust float valve.

E25.9.11 Adjust throttle.

E25.9.12 Adjust idle speed.

E25.9.13 Disassemble, clean, and reassemble a carburetor.

CRITERION-REFERENCED MEASURE

C25.9 Carburetor of a small gasoline engine serviced and adjusted according to the service manual.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Make a cutaway of a float type carburetor so that the float, needle, throttle valve, choke, and internal passage can be seen (E25.9.1-E25.9.5).

2. Display and demonstrate the operation, service, and adjustment of several types of carburetors (E25.9.1-E25.9.13).

3. Have students service and adjust carburetors from small engines brought from home (E25.9.5-E25.9.13).

4. Have students troubleshoot carburetors (E25.9.8-E25.9.12).

SELECTED TOOLS AND MATERIALS

Small engine tools
Parts cleaner and solvent
Repair parts
Several types of carburetors
Service manuals

SELECTED AUDIOVISUAL MATERIALS

Slide/cassette: Carburetor Laboratory. Hobar.
Transparency masters: Small Engines, Vol. 1. AAVIM.

SELECTED REFERENCES

Engines, Compact Equipment. John Deere.
Service and Repair Instructions. Briggs and Stratton.
Small Engines, Vol. 1. AAVIM.
Small Engines, Vol. 1, Student Workbook. AAVIM.
Small Gas Engines, Chapter 4. Roth and Baird.

DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

TASK/COMPETENCY

25.10 Service and maintain ignition system of small gasoline engine

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

25.10

PERFORMANCE OBJECTIVE

P25.10 Given a small engine and the necessary tools, service and maintain the ignition system according to the service manual.

SELECTED ENABLING OBJECTIVES

E25.10.1 Identify the types of ignition systems.

E25.10.2 Identify the parts and components of the ignition system.

E25.10.3 Explain the principles of operation of the ignition system.

E25.10.4 Identify the types of magnetos.

E25.10.5 Test the magneto.

E25.10.6 Remove, clean, gap, and install spark plug.

E25.10.7 Remove, inspect, and replace the flywheel.

E25.10.8 Replace the point plunger.

E25.10.9 Replace points and condenser.

E25.10.10 Adjust armature air gap.

E25.10.11 Test the solid state ignition system.

CRITERION-REFERENCED MEASURE

C25.10 Ignition system of a small gasoline engine serviced and maintained according to the service manual.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display and demonstrate the operation, service, and maintenance of ignition systems (E25.10.1-E25.10.12).

2. Have students practice the service and maintenance of the ignition system (E25.10.5-E25.10.12).

3. Have students use available test equipment (E25.10.5-E25.10.12).

4. Have students troubleshoot ignition systems (E25.10.5-E25.10.12).

SELECTED TOOLS AND MATERIALS

Small engine tools
Clean rags
Cleaning solvent
Spark plug tester
Magneto tester
Continuity test light
Magneto Ignition Kit #400, Hobar.

SELECTED AUDIOVISUAL MATERIALS

Transparency masters: Small Engines, Vol. 1. AAVIM.
Slides: Magneto Ignition System (#403). Hobar.

SELECTED REFERENCES

Service and Repair Instructions. Briggs and Stratton.
Small Engines, Vol. 2. AAVIM.
Small Engines, Vol. 2, Student Workbook. AAVIM.
Small Gas Engines, Chapter 5. Roth and Baird.

----------------Application--------------

DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

25.11 Service manual controls of small gasoline engine

COURSE

Agricultural Science and Mechanics II (8008)

25.11

PERFORMANCE OBJECTIVE

P25.11 Given necessary tools and a small gasoline engine with manual controls, service the manual controls. The controls must stop the engine and move from stop to fast/choke without binding.

SELECTED ENABLING OBJECTIVES

E25.11.1 Identify the safety practices to follow.

E25.11.2 Identify potential problems with manual controls.

E25.11.3 Replace throttle cable.

E25.11.4 Bend throttle cable.

E25.11.5 Service potential areas on the manual controls.

CRITERION-REFERENCED MEASURE

C25.11 Manual controls of small gas engine serviced, controls stopping the engine and moving from stop to fast/choke without binding.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students observe the operation of manual controls on several small engines (E25.11.1, E25.11.2).

2. Have students practice repairing manual controls that bind, will not operate, and/or need a new throttle cable (E25.11.3-E25.11.5).

SELECTED TOOLS AND MATERIALS

Small engine tools
Small engine with manual controls
Solvent
Lubricant
Throttle cable
Service manual

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Service and Repair Instructions. Briggs and Stratton.

---------------Application--------------

DUTY AREA

25. MAINTAINING SMALL GASOLINE ENGINES

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

25.12 Troubleshoot a small gasoline engine

COURSE

Agricultural Science and Mechanics II (8008)

25.12

PERFORMANCE OBJECTIVE

P25.12 Given a small gasoline engine that has problems or has been "bugged," troubleshoot the engine. Conclusion must be the same as that obtained by the instructor.

SELECTED ENABLING OBJECTIVES

E25.12.1 Identify safety precautions to follow.

E25.12.2 Identify the problem.

E25.12.3 Identify the system in which the problem is located.

E25.12.4 List possible causes of the problem.

CRITERION-REFERENCED MEASURE

C25.12 Troubleshooting performed on a small gas engine, conclusion being the same as that of the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the steps to follow in troubleshooting (E25.12.1-E25.12.4).

2. Have students practice troubleshooting an engine with only one problem at a time (E24.12.1-E25.12.4).

3. Have students practice "bugging" engines and listening to the sounds caused by the bugging (E25.12.1-E25.12.4).

SELECTED TOOLS AND MATERIALS

Small engine tools
Small engine

SELECTED AUDIOVISUAL MATERIALS

Slides: Troubleshooting #1, #2, #3. Briggs and Stratton.

SELECTED REFERENCES

Service and Repair Instructions. Briggs and Stratton.
Small Gasoline Engines, Chapter 9. Roth and Baird.

DUTY AREA

26. PRESERVING WOOD AND METAL

TASKS/COMPETENCIES

26.1 Identify and select wood and metal preservatives and equipment

26.2 Estimate the amount of preservative needed for a job

26.3 Prepare wood and metal surfaces for preservation

26.4 Apply preservatives to wood and metal surfaces with a paint brush

26.5 Clean and store a paint brush

26.6 Apply preservatives to wood and metal surfaces with a paint roller or pad

26.7 Apply preservatives to wood and metal surfaces with spray equipment

DUTY AREA

26. PRESERVING WOOD AND METAL

TASK/COMPETENCY

26.1 Identify and select wood and metal preservatives and equipment

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

26.1

PERFORMANCE OBJECTIVE

P26.1 Given the necessary equipment, supplies, and a wooden or metal item to preserve, identify and select wood and metal preservatives and equipment. Items identified and selected must correspond to those previously identified and selected by the instructor.

SELECTED ENABLING OBJECTIVES

E26.1.1 Define terms associated with preservatives.

E26.1.2 Identify forms of preserving wood and metal (pickling, enameling, painting, pressure treating, etc.).

E26.1.3 Identify types of wood and metal preservatives (paint, creosote, etc.).

E26.1.4 Identify equipment used to apply preservatives.

E26.1.5 Identify and select solvents.

E26.1.6 Explain instructions contained on preservative container label.

CRITERION-REFERENCED MEASURE

C26.1 Wood and metal preservatives and equipment identified and selected, items corresponding to those previously identified and selected by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students obtain circulars and information from hardware stores prior to discussing the need and importance of preservatives (E26.1.1-E26.1.3).
2. Display equipment and supplies for students to identify (E26.1.4, E26.1.5).
3. Have students determine which solvents to use to clean up or remove preservatives (E26.1.5).
4. Have students copy information from preservative container label and discuss the directions and ingredients (E26.1.6).

SELECTED TOOLS AND MATERIALS

Various preservatives for wood and metal
Examples of items treated with preservatives
Brushes
Drop cloth
Emery cloth
Ladder
Wire brush scraper
Masking tape
Compressed air
Spray gun
Paint stirrers
Paint tray
Respirator
Sandpaper
Screwdriver
Paint roller
Solvents

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 13. Wakeman.
Paints and Preservatives, pp. 61-72. Virginia Department of Education.
Preservative Treatment of Posts, Timber, and Lumber. U.S. Department of Agriculture.
Technical Woodworking, Section 7. Groneman and Glazener.

DUTY AREA

26. PRESERVING WOOD AND METAL

TASK/COMPETENCY

26.2 Estimate the amount of preservative needed for a job

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

26.2

PERFORMANCE OBJECTIVE

P26.2 Given an item or area needing to be preserved, estimate the amount of preservative needed for the job. The estimate must be within 10% of that estimated by the instructor.

SELECTED ENABLING OBJECTIVES

E26.2.1 Read label on preservative.

E26.2.2 Identify the type and conditions of material the preservative is intended to cover.

E26.2.3 Compare the composition of preservatives.

E26.2.4 Determine the square footage the preservative will cover.

E26.2.5 Determine the area (square feet) of the job.

E26.2.6 Divide the area of the job by the estimated coverage of the preservative.

E26.2.7 Add 10% to the estimated amount of preservative needed.

CRITERION-REFERENCED MEASURE

C26.2 Amount of needed preservative estimated within 10% of that estimated by the instructor.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display several labels from preservative containers. Discuss the contents of the preservative, and compare the contents with the estimated coverage (E26.2.1-E26.2.4).

2. Display samples of items to which preservatives have been applied (E26.2.3).

3. Have students determine the amount of preservative needed for several types of jobs (E26.2.4-E26.2.7).

4. Have students estimate the amount of preservative needed for jobs at home and report to class (E26.2.1-E26.2.7).

SELECTED TOOLS AND MATERIALS

Preservative labels
Preserved items
Prepared problems

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

None identified

-----------------Application--------------

DUTY AREA

26. PRESERVING WOOD AND METAL

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

26.3 Prepare wood and metal surfaces for preservation

COURSE

Agricultural Science and Mechanics II (8008)

26.3

PERFORMANCE OBJECTIVE

P26.3 Given an item of wood or metal and the necessary equipment and supplies, prepare the surface for preservation. The surface must be free of dust, dirt, oil, cuts, grooves, and scratches.

SELECTED ENABLING OBJECTIVES

E26.3.1 Explain the importance of surface preparation.

E26.3.2 Identify abrasives used in surface preparation.

E26.3.3 Describe the correct sanding procedures.

E26.3.4 Determine which grade of abrasive is needed.

E26.3.5 Explain "raising the grain" of wood.

E26.3.6 Describe safety precautions to follow in surface preparation.

E26.3.7 Remove old finish.

E26.3.8 Smooth surfaces.

E26.3.9 Explain the importance of primer.

E26.3.10 Apply pickling solution (metal).

E26.3.11 Remove old finish.

CRITERION-REFERENCED MEASURE

C26.3 Wood and metal surfaces prepared for preservation, surfaces free of dust, dirt, oil, cuts, grooves, and scratches.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate and explain the purpose of surface preparation (E26.3.1-E26.3.4).
2. Have students identify and select the correct abrasive (E26.3.2, E26.3.4).
3. Have students prepare the surface of wood and metal approved projects (E26.3.5-E26.3.11).

SELECTED TOOLS AND MATERIALS

Abrasives
Rags
Putty knife
Sanding block
Paint remover
Wire brush
Grinder
Cup brush
Respirator
Paint primers
Solvents

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Finishing Wood Furniture (publication 291). Virginia Cooperative Extension Service.
Modern Agriculture Mechanics, Chapter 13. Wakeman.
Technical Woodworking, Unit 120. Groneman and Glazener.
Tips and Ideas That Make Painting Easier. Home Center Institute.

----------------Application--------------

DUTY AREA

26. PRESERVING WOOD AND METAL

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

26.4 Apply preservatives to wood and metal surfaces with a paint brush

COURSE

Agricultural Science and Mechanics II (8008)

26.4

PERFORMANCE OBJECTIVE

P26.4 Given an item of wood or metal and the necessary equipment and supplies, apply preservative with a paint brush. The surface must be covered, smooth, and have no runs.

SELECTED ENABLING OBJECTIVES

E26.4.1 Define terminology associated with painting.

E26.4.2 Select correct preservative.

E26.4.3 Select correct brush, equipment, and materials required.

E26.4.4 Prepare the surface (P26.3).

E26.4.5 Prepare preservative for application.

E26.4.6 Grasp the brush correctly.

E26.4.7 Dip the brush into the preservative.

E26.4.8 Touch the brush to the surface at several spots.

E26.4.9 Use long leveling brush strokes.

E26.4.10 Finish each area by back-and-forth motions.

CRITERION-REFERENCED MEASURE

C26.4 Preservative applied to wood and metal surfaces with a brush, surface smooth, and free of runs.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students read and discuss paint literature, including labels and instructions on containers (E26.4.1-E26.4.3).
2. Have students compare the types of preservatives, paint, and materials available and select the most appropriate (E26.4.2, E26.4.3).
3. Have students apply preservatives to approved shop projects (E26.4.4-E26.4.10).

SELECTED TOOLS AND MATERIALS

Abrasives
Rags
Drop cloth
Masking tape
Solvent
Preservatives
Paint brushes
Labels

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Finishing Wood Furniture (Publication 291). Virginia Cooperative Extension Service.
Modern Agricultural Mechanics, Chapter 13, Wakeman.
Paints and Preservatives, pp. 61-72. Virginia Department of Education.
Tips and Ideas That Make Painting Easier. Home Center Institute.

----------------Application--------------

DUTY AREA

26. PRESERVING WOOD AND METAL

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

26.5 Clean and store a paint brush

COURSE

Agricultural Science and Mechanics II (8008)

26.5

PERFORMANCE OBJECTIVE

P26.5 Given the necessary equipment, supplies, and a brush used to apply preservative, clean and store a paint brush. All the preservative must be removed, and the brush must be neatly wrapped with paper and stored in the proper place.

SELECTED ENABLING OBJECTIVES

E26.5.1 Identify preservative used.

E26.5.2 Identify solvents.

E26.5.3 Select correct solvent.

E26.5.4 Wipe out excess preservative.

E26.5.5 Dip brush in solvent and rub bristles together.

E26.5.6 Shake out excess solvent.

E26.5.7 Check for presence of preservative (clean again, if found).

E26.5.8 Wrap in wax paper and fasten with rubber band.

E26.5.9 Store in correct place.

CRITERION-REFERENCED MEASURE

C26.5 Paint brush cleaned and stored, preservative removed, brush wrapped neatly with paper.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate the correct procedures for cleaning and storing brushes (E26.5.1-E26.5.9).
2. Have students identify solvents by smell (E26.5.2).
3. Have students clean and store brushes used to finish approved shop projects (E26.5.1-E26.5.9).

SELECTED TOOLS AND MATERIALS

Newspaper
Rags
Solvents
Dirty brushes
Containers

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Technical Woodworking, Unit 122. Groneman and Glazener.
Tips and Ideas That Make Painting Easier. Home Center Institute.

DUTY AREA

26. PRESERVE WOOD AND METAL

TASK/COMPETENCY

26.6 Apply preservatives to wood and metal surfaces with a paint roller or pad

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

26.6

PERFORMANCE OBJECTIVE

P26.6 Given an item of wood or metal and the necessary equipment and supplies, apply preservative with a paint roller or pad. The surface must be covered smoothly and have no runs.

SELECTED ENABLING OBJECTIVES

E26.6.1 Select the correct preservative.

E26.6.2 Select the correct paint roller or pad and materials required.

E26.6.3 Prepare the surface.

E26.6.4 Prepare preservative for application.

E26.6.5 Pour paint into roller tray.

E26.6.6 Apply paint to roller.

E26.6.7 Spread paint evenly.

E26.6.8 Clean roller or pad and equipment.

CRITERION-REFERENCED MEASURE

C26.6 Preservative applied to wood and metal surfaces using a roller or pad, surface covered, smooth, and free of runs.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students compare the types of preservatives and equipment and select the most appropriate (E26.6.1, E26.6.2).
2. Prepare the surface of projects (E26.6.3).
3. Demonstrate the use of a paint roller or pad (E26.6.4-E26.6.8).
4. Have students apply preservatives to approved shop projects (E26.6.4-E26.6.8).
5. Encourage students to report home painting activities as part of their improvement projects for SOEPs (E26.6.1-E26.6.8).

SELECTED TOOLS AND MATERIALS

Abrasives
Rags
Drop cloth
Masking tape
Solvent
Roller or pad
Preservatives
Labels

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Finishing Wood Furniture (publication 291). Virginia Cooperative Extension Service.
Modern Agricultural Mechanics, Chapter 13. Wakeman.
Tips and Ideas That Make Painting Easier. Home Center Institute.

DUTY AREA

26 PRESERVING WOOD AND METAL

TASK/COMPETENCY

26.7 Apply preservatives to wood and metal surfaces with spray equipment

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

26.7

PERFORMANCE OBJECTIVE

P26.7 Given an item of wood or metal and the necessary equipment and supplies, apply preservative with spray equipment. The surface must be covered, smooth, and have no runs.

SELECTED ENABLING OBJECTIVES

E26.7.1 Select the correct preservative.

E26.7.2 Prepare the surface.

E26.7.3 Prepare preservative for application.

E26.7.4 Assemble equipment.

E26.7.5 Adjust pressure and spray pattern.

E26.7.6 Hold the spray gun perpendicular to the surface.

E26.7.7 Keep strokes parallel to the surface.

E26.7.8 Spray at an even speed matched to the output of the gun.

E26.7.9 Fan strokes at the ends of the strokes.

E26.7.10 Clean spray equipment.

CRITERION-REFERENCED MEASURE

C26.7 Preservative applied with spray equipment, surface covered, smooth, and free of runs.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students compare the types of preservatives and equipment and select the most appropriate (E26.7.1).

2. Demonstrate the use of spray equipment (E26.7.2-E26.7.10).

3. Have students use scrap materials to practice using spray equipment (E26.7.3-E26.7.10).

SELECTED TOOLS AND MATERIALS

Abrasives
Rags
Drop cloth
Masking tap
Solvent
Spray equipment
Paint labels
Compressor
Paint

SELECTED AUDIOVISUAL MATERIALS

Transparency masters: Paints and Preservatives, T1-T4c, pp. 45-57. Virginia Department of Education

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 13. Wakeman.
Paints and Preservatives. Virginia Department of Education.

DUTY AREA

27. PERFORMING ROPE WORK

TASKS/COMPETENCIES

27.1 Select and care for rope

27.2 Finish the end of a rope

27.3 Join two ropes

27.4 Splice rope

27.5 Make a rope halter

----------------Application--------------

DUTY AREA

27. PERFORMING ROPE WORK

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

27.1 Select and care for rope

COURSE

Agricultural Science and Mechanics II (8008)

27.1

PERFORMANCE OBJECTIVE

P27.1 Given an animal or situation in which rope is required, select and care for the rope. The rope selected must be suitable for the situation. Use of the rope should not result in unnecessary damage.

SELECTED ENABLING OBJECTIVES

E27.1.1 Identify types of rope.

E27.1.2 List important characteristics of rope.

E27.1.3 List characteristics to consider in selecting rope.

E27.1.4 List important factors to consider in caring for rope.

CRITERION-REFERENCED MEASURE

C27.1 Rope selected and cared for, rope suitable for situation and used without unnecessary damage.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display several types of rope, and discuss use and care (E27.1.1-E27.1.4).
2. Have students identify uses they make of rope, why they use the particular type of rope (E27.1.1, E27.1.2).
3. Have students explain situations where rope is used. Give reasons why the rope is damaged, and explain how damage could have been prevented (E27.1.3, E27.1.4).
4. Have students bring in examples of damaged rope used at home and explain how the rope was damaged (E27.1.4).

SELECTED TOOLS AND MATERIALS

Several types of rope

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 19. Phipps.

----------------Application--------------

DUTY AREA

27. PERFORMING ROPE WORK

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

27.2 Finish the end of a rope

COURSE

Agricultural Science and Mechanics II (8008)

27.2

PERFORMANCE OBJECTIVE

P27.2 Given a new rope or one with frayed ends, finish the end of a rope. The finished end must be neat, smooth, and permanent.

SELECTED ENABLING OBJECTIVES

E27.2.1	List important reasons for finishing the end of a rope.
E27.2.2	Relay loose ends.
E27.2.3	Whip rope ends.
E27.2.4	Tie overhand knot.
E27.2.5	Tie figure-eight knot.
E27.2.6	Tie wall knot with crown.
E27.2.7	Make an end-of-crown splice.

CRITERION-REFERENCED MEASURE

C27.2 End of a rope finished, end neat, smooth, and permanent.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students bring in rope that has been used at home and have them examine the differences in those with and without a finished end (E27.2.1).
2. Demonstrate and have students practice the different means to finish the end of a rope (E27.2.1-E27.2.7).

SELECTED TOOLS AND MATERIALS

Rope
Illustrations on finishing rope ends

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 19. Phipps.

----------------Application--------------

DUTY AREA

27. PERFORMING ROPE WORK

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

27.3 Join two ropes

COURSE

Agricultural Science and Mechanics II (8008)

27.3

PERFORMANCE OBJECTIVE

P27.3 Given two ropes, join the two ropes. The knot should hold securely without slipping and untie readily.

SELECTED ENABLING OBJECTIVES

E27.3.1 Tie a square knot.

E27.3.2 Tie a surgeon's knot.

E27.3.3 Tie a carrick bend.

E27.3.4 Tie a slip knot.

E27.3.5 Tie a manger knot.

E27.3.6 Tie a bowline knot.

E27.3.7 Tie a cat's paw.

E27.3.8 Tie a half hitch.

E27.3.9 Tie a timber hitch.

E27.3.10 Tie a timber hitch and half hitch.

E27.3.11 Tie a clove hitch.

E27.3.12 Give the application of each method of joining two ropes.

CRITERION-REFERENCED MEASURE

C27.3 Two ropes joined, ropes held securely and able to be untied readily.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students bring in several examples of connected ropes and display them (E27.3.1-E27.3.12).
2. Have students practice joining two ropes from illustrations (E27.3.1-E27.3.11).
3. Have students discuss the differences in appearance (E27.3.12).

SELECTED TOOLS AND MATERIALS

Illustrations or examples of joining two ropes

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Handbook of Livestock Equipment, Chapter XI. Jurgenson.
Mechanics in Agriculture, Chapter 19. Phipps.

DUTY AREA

27. PERFORMING ROPE WORK

TASK/COMPETENCY

27.4 Splice rope

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

27.4

PERFORMANCE OBJECTIVE

P27.4 Given a broken rope, splice rope. The splice must be neat and able to carry the same load as any other part of the rope.

SELECTED ENABLING OBJECTIVES

E27.4.1 Explain the essentials of a strong splice.

E27.4.2 Describe the steps in rope splicing:
a. Unlay the ends
b. Interlock the ends
c. Relay and weave ends together
d. Remove excess ends.

E27.4.3 Repair broken strands, if necessary.

E27.4.4 Prepare loop splice.

E27.4.5 Prepare eye splice or side splice.

E27.4.6 Test for strength.

CRITERION-REFERENCED MEASURE

C27.4 Rope spliced, able to carry the same load as any other part of the rope.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Illustrate or give case situations of poor splices (E27.4.1).
2. Have students practice making short and long splices (E27.4.2).
3. Have students practice the other three types of splices (E27.4.3-E27.4.5).
4. Have students test splices for strength (E27.4.6).

SELECTED TOOLS AND MATERIALS

Illustrations or examples of splices

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 19. Phipps.

DUTY AREA

27. PERFORMING ROPE WORK

TASK/COMPETENCY

27.5 Make a rope halter

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

27.5

PERFORMANCE OBJECTIVE

P27.5 Given an animal needing a halter and rope, make a rope halter. Halter must look neat and fit the animal for which it is intended.

SELECTED ENABLING OBJECTIVES

E27.5.1 List one advantage of each type of halter: adjustable and nonadjustable.

E27.5.2 Make a nonadjustable halter.

E27.5.3 Measure animal's head.

E27.5.4 Make an adjustable halter.

E27.5.5 Fit halter to animal.

CRITERION-REFERENCED MEASURE

C27.5 Rope halter made, halter neat, fitting the animal for which it is intended.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Have students fit an animal with both types of halters, and discuss the advantage of each (E27.5.1).
2. Have students make rope halters for show animals (E27.5.2-E27.5.5).

SELECTED TOOLS AND MATERIALS

3/8" diameter rope for small cattle
1/2" diameter rope for large animals

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Handbook of Livestock Equipment, pp. 324-325. Jurgenson.
Mechanics in Agriculture, Chapter 19. Phipps.

DUTY AREA

28. PERFORMING PLUMBING OPERATIONS

TASKS/COMPETENCIES

28.1 Interpret a blueprint for plumbing

28.2 Identify plumbing tools, equipment, and supplies

28.3 Identify pipe fittings

28.4 Cut a steel pipe to proper length

28.5 Thread pipe

28.6 Install pipe fittings

28.7 Cut copper tubing

28.8 Solder copper tubing to fitting

28.9 Join plastic pipe to fitting with solvent

28.10 Repair leaky value

28.11 Complete an approved plumbing exercise

DUTY AREA

28. PERFORMING PLUMBING OPERATIONS

TASK/COMPETENCY

28.1 Interpret a blueprint for plumbing

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

28.1

PERFORMANCE OBJECTIVE

P28.1 Given a blueprint for plumbing, interpret the blueprint with 90% accuracy including the views, dimensions, lines, abbreviations, symbols, and materials needed.

SELECTED ENABLING OBJECTIVES

E28.1.1 Identify views, dimensions, lines, abbreviations, and symbols on the blueprint.

E28.1.2 Identify materials needed to complete the plumbing job.

E28.1.3 Define key concepts related to blueprints.

E28.1.4 Sketch plumbing plans.

CRITERION-REFERENCED MEASURE

C28.1 Blueprint for plumbing interpreted with 90% accuracy including views, dimensions, lines, abbreviations, symbols, and materials needed.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies (Duty Area 5) needed in agricultural mechanics (E28.1.1).
2. Observe blueprints at school or at an establishment that prepares blueprints (E28.1.1-E28.1.3).
3. Have students prepare a bill of materials from the blueprint (E28.1.2).
4. Have students study and use blueprint terms in discussing blueprints (E28.1.3).
5. Have students prepare sketches of plumbing plans (E28.1.4).

SELECTED TOOLS AND MATERIALS

Plumbing blueprints
Drafting equipment and supplies

SELECTED AUDIOVISUAL MATERIALS

Transparencies: Blueprint Reading Basics (58 transparencies). Hobar.

SELECTED REFERENCES

Modern Agricultural Mechanics, pp. 21-28. Wakeman.

DUTY AREA

28. PERFORMING PLUMBING OPERATIONS

TASK/COMPETENCY

28.2 Identify plumbing tools, equipment, and supplies

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

28.2

PERFORMANCE OBJECTIVE

P28.2 Given a selection of plumbing tools, equipment, and supplies, identify them with 90% accuracy on a written or oral test.

SELECTED ENABLING OBJECTIVES

E28.2.1 Select tools, equipment, and supplies used for plumbing.

E28.2.2 Name the parts of plumbing tools and equipment.

E28.2.3 Describe the uses and functions of plumbing tools, equipment, and supplies.

CRITERION-REFERENCED MEASURE

C28.2 Plumbing tools, equipment, and supplies identified with 90% accuracy on a written or oral test.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate the uses of plumbing tools, equipment, and supplies (E28.2.1-E28.2.3).
2. Have students use references to identify plumbing tools, equipment, and supplies (E28.2.1-E28.2.3).
3. Test students' ability to identify plumbing items after use (E28.2.1-E28.2.3).
4. Have students prepare a list of plumbing tools, equipment, and supplies at home or in their SOEPs (E28.2.1-E28.2.3).

SELECTED TOOLS AND MATERIALS

Pipe threader
Pipecutters
Reaming tools
Pipe-threading dies
Pipe-vise
Tube cutter or reamer
Thread cutting oil
Flaring tool and block
Plumb bob
Caulking and packing irons
Soldering iron
Chain vise
Torch
Pipe dope
Tubing bender
Pipe wrench
Plastic pipe
Copper pipe
Pipe fittings
Valves

SELECTED AUDIOVISUAL MATERIALS

Film: Hand Tools for Metal Work (48912). Virginia Department of Education.
Transparency: Shop Tool Identification. University of Illinois.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 14. Wakeman.
Plumbing, pp. 156-157. V-TECS.

----------------Application--------------

DUTY AREA

28. PERFORMING PLUMBING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

28.3 Identify pipe fittings

COURSE

Agricultural Science and Mechanics II (8003)

28.3

PERFORMANCE OBJECTIVE

P28.3 Given a selection of pipe fittings, identify pipe fittings with 85% accuracy.

SELECTED ENABLING OBJECTIVES

E28.3.1 Identify different types of pipe.

E28.3.2 Determine the size of pipe fittings.

E28.3.3 List the functions of selected pipe fittings.

E28.3.4 Select types of fittings for specific situations.

CRITERION-REFERENCED MEASURE

C28.3 Pipe fittings identified with 85% accuracy.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display, describe, and demonstrate the uses of pipe fittings (E28.3.1-E28.3.3).
2. Have students determine the types of fittings needed for several specific situations (E28.3.1-E28.3.3).

SELECTED TOOLS AND MATERIALS

Pipe fittings
Examples of uses of pipe fittings

SELECTED AUDIOVISUAL MATERIALS

Transparency master: Pipe Fittings, p. 173F, Vocational Agriculture II. Oklahoma State Board of Vocational and Technical Education.
Slide/cassette: Laboratory Exercise in Pipe Fitting. Hobar.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 14. Wakeman.

DUTY AREA

28 PERFORMING PLUMBING OPERATIONS

TASK/COMPETENCY

28.4 Cut steel pipe to proper length

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

28.4

PERFORMANCE OBJECTIVE

P28.4 Given a section of steel pipe and the necessary equipment, cut steel pipe to within ± 1/16" of the length required. The cut ends must be free of burrs.

SELECTED ENABLING OBJECTIVES

E28.4.1 Identify safety practices to follow.

E28.4.2 Secure pipe in vise.

E28.4.3 Measure and mark length to be cut.

E28.4.4 Use one-wheel cutter.

E28.4.5 Use hacksaw (P9.4).

E28.4.6 Ream cut ends.

CRITERION-REFERENCED MEASURE

C28.4 Steel pipe cut to within ± 1/16" of required length, cut ends free of burrs.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review safety procedures (E28.4.1).
2. Demonstrate cutting steel pipe with a one-wheel cutter and a hacksaw (E28.4.2-E28.4.6).
3. Provide sections of steel pipe for students to practice cutting (E28.4.1-E28.4.6).

SELECTED TOOLS AND MATERIALS

Steel pipe
Burr reamer
Hacksaw
One-wheel cutter
Vise
Cutting oil

SELECTED AUDIOVISUAL MATERIALS

Film: Hand Tools for Metal Work (48912). Virginia Department of Education.
Filmstrip: Steel and Plastic Pipe. Hobar.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 14. Wakeman.
Plumbing, pp. 39-42. V-TECS.

DUTY AREA

28. PERFORMING PLUMBING OPERATIONS

TASK/COMPETENCY

28.5 Thread pipe

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND

COURSE

Agricultural Science and
Mechanics II (8008)

28.5

PERFORMANCE OBJECTIVE

P28.5 Given a section of pipe, equipment, and necessary tools, thread pipe. The completed threads must be free of nicks and burrs.

SELECTED ENABLING OBJECTIVES

E28.5.1 Explain the difference in pipe threads and other types of threads.

E28.5.2 Identify safety practices to follow.

E28.5.3 Select die.

E28.5.4 Place round guide end of pipe die stock on pipe end to be threaded.

E28.5.5 Press die against pipe end with heel of hand. Take short clockwise strokes to begin threads.

E28.5.6 Apply cutting oil.

E28.5.7 Cut desired length of threads (Refer to proper table).

E28.5.8 Remove die.

E28.5.9 Inspect threads.

E28.5.10 Ream out head in pipe end.

CRITERION-REFERENCED MEASURE

C28.5 Pipe threaded, free of nicks and burrs.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Explain the differences in pipe threads and NC and NF threads (E28.5.1).
2. Review safety practices for metal work (E28.5.2).
3. Demonstrate cutting pipe threads (E28.5.3-E28.5.10).
4. Have students practice (E28.5.3-E28.5.10).
5. Provide assistance as needed (E28.5.3-E28.5.10).
6. Compare cut threads with those on purchased pipe (E28.5.9).
7. Refer to competency 9.10 if not previously covered (E28.5.7).

SELECTED TOOLS AND MATERIALS

Pipe die set
Pipe vise
Pipe wrench
Pipe reamer
Cutting oil
Sections of pipe
Pipe data (threads per nick, etc.)
Rule

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Bench Metalworking Series. Bergwall Productions, Inc.
Transparency master: Pipe Vs. Bolt Threads, p. 181F. Vocational Agriculture II. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 34. Phipps.
Modern Agricultural Mechanics, Chapter 14. Wakeman.
Plumbing, pp. 57-59. V-TECS.

----------------Application--------------

DUTY AREA

28. PERFORMING PLUMBING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

28.6 Install pipe fittings

COURSE

Agricultural Science and Mechanics II (8008)

28.6

PERFORMANCE OBJECTIVE

P28.6 Given a section of pipe and a fitting, install pipe fitting. There can be no stripped threads and no leaks.

SELECTED ENABLING OBJECTIVES

E28.6.1 Identify pipe fittings (P28.3).

E28.6.2 Determine the size of pipe fittings.

E28.6.3 Apply pipe dope or teflon tape to threads.

E28.6.4 Start fittings by hand, turning clockwise.

E28.6.5 Tighten with pipe wrench.

CRITERION-REFERENCED MEASURE

C28.6 Pipe fittings installed with no stripped threads or leaks.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Demonstrate how to install pipe fittings (E28.6.1-E28.6.5).
2. Have students practice by completing the plumbing exercise, pp. 436-439, Wakeman (E28.6.1-E28.6.5).

SELECTED TOOLS AND MATERIALS

Pipe wrench
Pipe fittings
Pipe
Pipe dope
Teflon tape

SELECTED AUDIOVISUAL MATERIALS

Transparency master: Fittings, p. 173F, Vocational Agriculture II. Oklahoma State Board of Vocational and Technical Education.

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 34. Phipps.
Modern Agricultural Mechanics, Chapter 14. Wakeman.

DUTY AREA

28. PERFORMING PLUMBING OPERATIONS

TASK/COMPETENCY

28.7 Cut copper tubing

----------------Application----------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

28.7

PERFORMANCE OBJECTIVE

P28.7 Given a section of copper tubing and the necessary tools and equipment, cut copper tubing. The length must be ± 1/16" of designated length. Tubing must be free of burrs and cannot be out of round.

SELECTED ENABLING OBJECTIVES

E28.7.1 Identify the three weights of copper tubing.

E28.7.2 Identify safety practices to follow.

E28.7.3 Measure and mark length to be cut.

E28.7.4 Cut with tube cutter.

E28.7.5 Ream cut ends.

CRITERION-REFERENCED MEASURE

C28.7 Copper tubing cut to within ± 1/16" of designated length, free of burrs, not out of round.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display the three weights of copper tubing and discuss the intended uses (E28.7.1).
2. Demonstrate procedures in cutting copper tubing (E28.7.2-E28.7.5).
3. Have students practice cutting designated lengths of tubing (E28.7.2-E28.7.5).

SELECTED TOOLS AND MATERIALS

Tubing cutter
Hacksaw
Rule
Vise
Reamer

Types M, L, and K copper tubing

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Copper Tubing. Hobar.

SELECTED REFERENCES

Building Repairer, p. 49. V-TECS.
Plumbing, Chapter 3. Hedden.

DUTY AREA

28. PERFORMING PLUMBING OPERATIONS

TASK/COMPETENCY

28.8 Solder copper tubing to fitting

----------------Application--------------

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

28.8

PERFORMANCE OBJECTIVE

P28.8 Given a section of copper tubing, fitting, and the necessary equipment and supplies, solder copper tubing. The joint must be neat, clean, and watertight.

SELECTED ENABLING OBJECTIVES

E28.8.1 Identify fittings.

E28.8.2 Identify safety practices to follow.

E28.8.3 Measure and mark tubing.

E28.8.4 Cut tubing.

E28.8.5 Clean tubing.

E28.8.6 Apply flux.

E28.8.7 Insert tubing into fitting.

E28.8.8 Revolve tubing.

E28.8.9 Heat tubing (P11.4).

E28.8.10 Flow solder into the joint.

E28.8.11 Clean the joint.

E28.8.12 Test for leak.

CRITERION-REFERENCED MEASURE

C28.8 Copper tubing soldered to fitting joint, neat, clean, and watertight.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review competencies 28.3 and 28.7 on identifying fittings and cutting tubing (E28.8.1-E28.8.4).

2. Have students observe a plumber connect copper tubing to fittings (E28.8.2-E28.8.12).

3. Demonstrate the correct procedure for sweating or soldering copper tubing to a fitting (E28.8.5-E28.8.12).

4. Have students practice connecting different pipe fittings to copper tubing (E28.8.2-E28.8.12).

SELECTED TOOLS AND MATERIALS

Tubing cutter
Vise
Steel wool (fine)
Flux
Solder
Propane torch
Rags
Reamer
Rule
Copper fittings

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Copper Tubing. Hobar

SELECTED REFERENCES

Mechanics in Agriculture, Chapter 34. Phipps.
Plumbing, Chapter 3. Hedden.

----------------Application--------------

DUTY AREA

28. PERFORMING PLUMBING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

28.9 Join plastic pipe to fitting with solvent

COURSE

Agricultural Science and Mechanics II (8008)

28.9

PERFORMANCE OBJECTIVE

P28.9 Given a section of plastic pipe, a fitting, and the necessary equipment and supplies, join plastic pipe to fitting with solvent. The joint must be watertight, neat, and connected at the specified angle.

SELECTED ENABLING OBJECTIVES

E28.9.1 Identify the four basic types of plastic pipe.

E28.9.2 Identify types of solvent used on plastic pipe.

E28.9.3 Determine size of plastic pipe and fittings.

E28.9.4 Cut plastic pipe.

E28.9.5 Remove burrs, grease, and dirt.

E28.9.6 Select fittings.

E28.9.7 Apply solvent adhesive.

E28.9.8 Insert pipe into fitting.

E28.9.9 Revolve fitting.

E28.9.10 Adjust alignment.

E28.9.11 Remove excess solvent.

E28.9.12 Test for leak.

CRITERION-REFERENCED MEASURE

C28.9 Plastic pipe joined to fitting with solvent, joint neat, watertight, and connected at specified angle.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display and discuss the uses of the four basic types of plastic pipe and solvents used (E28.9.1).
2. Demonstrate joining pipe with solvent (E28.9.2-E28.9.12).
3. Have students observe a plumber working with plastic pipe (E28.9.2-E28.9.12).
4. Have a plumber demonstrate joining pipe with solvent (E28.9.2-E28.9.12).
5. Have students practice (E28.9.2-E28.9.12).

SELECTED TOOLS AND MATERIALS

Plastic pipe (PVC, CPVC, PB, ABS)
Plastic pie cutter or hacksaw
Sandpaper
Pipe solvent
Plastic fittings
Rags
Water

SELECTED AUDIOVISUAL MATERIALS

Filmstrip: Steel and Plastic Pipe. Hobar.

SELECTED REFERENCES

Plumbing, Chapter 5. Hedden.
Plumbing, p. 54. V-TECS.

DUTY AREA

28. PERFORMING PLUMBING OPERATIONS

TASK/COMPETENCY

28.10 Repair leaky valve

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PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

COURSE

Agricultural Science and Mechanics II (8008)

28.10

PERFORMANCE OBJECTIVE

P28.10 Given a leaky valve and the necessary tools and supplies, repair leaky valve. The valve must not leak and faucet or valve parts must not show damage from tools.

SELECTED ENABLING OBJECTIVES

E28.10.1 Identify types of valves.

E28.10.2 Shut off water supply.

E28.10.3 Remove valve stem.

E28.10.4 Replace washer at end of stem, if necessary.

E28.10.5 Replace screw for washer, if necessary.

E28.10.6 Remove valve seat, if necessary.

E28.10.7 Reface valve seat, if necessary.

E28.10.8 Replace valve stem packing.

E28.10.9 Apply special lubricant.

E28.10.10 Reassemble.

E28.10.11 Check for leak.

CRITERION-REFERENCED MEASURE

C28.10 Leaky valve repaired, no leaks or damage by tools.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Display and demonstrate the types of valves (E28.10.1).
2. Have students observe a plumber repair a leaky valve, or demonstrate the procedure (E28.10.2-E28.10.11).
3. Obtain examples of corroded fixtures to display (E28.10.1).
4. Have students practice after observing repaired or new fixtures (E28.10.2-E28.10.11).
5. Have students repair leaky valves in faucets at home (E28.10.2-E28.10.11).

SELECTED TOOLS AND MATERIALS

Old corroded valves
New valves
Leaky valves
Wrenches
Screwdrivers
Valve seat refacer
Pliers

SELECTED AUDIOVISUAL MATERIALS

Transparency master: Types of Valves, p. 175, Vocational Agriculture II. Oklahoma State Board of Vocational and Technical Education.

Filmstrip/cassette: Fittings and Valves. Bergwall Productions, Inc.

SELECTED REFERENCES

Modern Agricultural Mechanics, Chapter 14. Wakeman.
Plumbing, Chapter 9. Hedden.
Plumbing, pp. 148-149. V-TECS.

----------------Application--------------

DUTY AREA

28. PERFORMING PLUMBING OPERATIONS

PROGRAM

AGRICULTURAL SCIENCE AND MECHANICS

TASK/COMPETENCY

28.11 Complete an approved plumbing exercise

COURSE

Agricultural Science and Mechanics II (8008)

28.11

PERFORMANCE OBJECTIVE

P28.11 Given an assignment to complete an approved plumbing exercise and access to the necessary tools, equipment, and supplies, complete an approved plumbing exercise. Exercise must be approved by the instructor and conform to the plans and specifications.

SELECTED ENABLING OBJECTIVES

E28.11.1 Select or draw a plan.

E28.11.2 Interpret the plans.

E28.11.3 Select the materials, equipment, and supplies for the exercise.

E28.11.4 Estimate the cost and time to complete exercise.

E28.11.5 Describe the types of skills needed.

E28.11.6 Identify safety practices to follow.

E28.11.7 Complete the exercise.

E28.11.8 Evaluate the quality of work.

E28.11.9 Demonstrate safe use of tools and equipment.

CRITERION-REFERENCED MEASURE

C28.11 Instructor-approved plumbing exercise completed, conforming to plans and specifications.

SELECTED INSTRUCTIONAL ACTIVITIES

1. Review drawing and sketching competencies for agricultural mechanics (E28.11.1, E28.11.2).
2. Have students list needed resources and complete a bill of materials and cost (E28.11.3, E28.11.4).
3. Have students describe procedures to follow (E28.11.5).
4. Verify that students have passed a safety test on plumbing (E28.11.6, E28.11.9).
5. Include the latest information and materials in the exercise (E28.11.1-E28.11.9).
6. Observe and provide individual assistance when needed (E28.11.1-E28.11.9).

SELECTED TOOLS AND MATERIALS

Plumbing tools
Pipe
Copper tubing
Pipe dope
Torch
Cutting oil
Other (as required by plan)

SELECTED AUDIOVISUAL MATERIALS

None identified

SELECTED REFERENCES

Modern Agricultural Mechanics, pp. 436-439. Wakeman.

SECTION 2

COURSES

The agricultural science and mechanics courses described in this section are based on the task analyses presented in Section 1 and have been approved by the Virginia Department of Education.

To assist program developers for all agricultural education programs and agricultural science and mechanics instructors, this section is organized as follows:

Fundamental Courses Relative to All Agricultural Education Programs

Agricultural Science and Mechanics I--Course description
Suggested teaching sequence
Course outline

Agricultural Science and Mechanics II--Course description
Suggested teaching sequence
Course outline

Considering the occupational nature of these courses, it is strongly suggested that the teaching sequence for each course be reviewed and adapted according to established training plans for simulated or actual on-the-job work experience and opportunities.

FUNDAMENTAL COURSES RELATIVE TO ALL AGRICULTURAL EDUCATION PROGRAMS

Agricultural Science and Mechanics I
Agricultural Science and Mechanics II

DESCRIPTION: Agricultural Science and Mechanics is introductory and basic in nature and provides a background for success in agricultural occupations. Students develop basic skills and are provided guidance and counseling that will help them to select the advanced course option leading to entry-level employment in an agricultural occupation. Basic principles of the sciences and economics are reviewed, studied, and applied to agricultural situations. This two-year program of study provides much of the knowledge and many of the skills common to agricultural production and employment in off-farm agricultural industries and businesses.

The program covers the first two years in the agricultural education curriculum and is normally a prerequisite for entry into agricultural courses taught in the third, fourth, and fifth years. Schools that offer the third, fourth, and fifth year programs without the first two years of agricultural science and mechanics must include the essential units of instruction from these basic courses within the course content of the specialized areas.

CIP CODE: 01.0301

SUGGESTED GRADE LEVEL: 8, 9, 10

PREREQUISITES: None

APPROVED COURSES	VA COURSE CODE	DOT CODE AND TITLE
*Agricultural Science and Mechanics I	8006	(Refer to inside front cover for listing of all applicable DOTs for both courses.)
*Agricultural Science and Mechanics II	8008	

*Required for all programs

AGRICULTURAL SCIENCE AND MECHANICS I

COURSE DESCRIPTION:	Agricultural Science and Mechanics I is a one-year, single period, occupational preparation course usually offered at the eighth-grade level. Approximately one-half of the course is devoted to agricultural mechanics, with emphasis placed on skill development in basic metals, tool fitting and cold metals, introduction to arc welding, sheet metal working, soldering and brazing, plan reading and sketching, and hand woodworking. The remainder of the course emphasizes the development of competencies in plant sciences, rural and urban living, leadership, and resource conservation.
PREREQUISITE:	None
SUGGESTED GRADE LEVEL:	8, 9

TASK/COMPETENCY SEQUENCE

1.1 Identify the scope of agriculture
1.2 Identify the three main components of an agricultural education program
1.3 Identify departmental policies and procedures
1.4 Demonstrate safe and proper use of departmental tools and equipment
1.5 Select and use fire extinguishers
1.6 Secure first aid assistance in case of an accident or emergency
2.1 Identify possible careers in agriculture
2.2 Select and evaluate local agricultural employment opportunities
3.1 Survey local occupational experience opportunities
3.2 Develop an annual plan of occupational experience
3.3 Prepare an occupational experience program agreement
3.4 Identify occupational tasks
3.5 Keep records
3.6 Summarize and analyze records of supervised occupational experience programs
3.7 Select FFA proficiency awards applicable to supervised occupational experiences
3.8 Complete FFA proficiency award application
3.9 Demonstrate ability to secure occupational work experience
4.1 Identify values and purposes of agricultural mechanics education
4.2 Maintain good housekeeping activities
4.3 Follow laboratory organization procedures
4.4 Demonstrate and use sound laboratory safety rules
5.1 Identify and select equipment and supplies for drawing and sketching
5.2 Draw lines
5.3 Draw view of objects
5.4 Sketch freehand
5.5 Draw a laboratory project plan

TASK/COMPETENCY SEQUENCE

6.1 Identify metals by physical properties
6.2 Identify metals by spark test
6.3 Identify metals by chip test
6.4 Identify metals by magnetic test
6.5 Identify metals by acid test
7.1 Interpret hot metalworking plans
7.2 Identify hot metalworking tools, equipment, and supplies
7.3 Heat metal
7.4 Anneal ferrous metal
7.5 Harden ferrous metal
7.6 Temper ferrous metal
7.7 Shape metal
7.8 Construct an approved hot metalworking project
8.1 Interpret tool-fitting plans
8.2 Identify and select tools, equipment, and supplies for tool fitting
8.3 Make a tool-fitting template
8.4 Use the grinder to sharpen tools
8.5 Clean and preserve tools
8.6 Fit tools with handles
8.7 Recondition an agricultural mechanic tool
9.1 Interpret cold metalworking plans
9.2 Identify cold metalworking tools, equipment, and supplies
9.3 Measure and lay out metal
9.4 Cut metal with a hacksaw
9.5 Cut metal with a cold chisel
9.6 Cut metal with abrasive cut-off wheel or saw
9.7 Operate bolt cutter
9.8 Drill metal with drill press
9.9 Tap threads
9.10 Cut threads
9.11 Finish metal with a file
9.12 Construct an approved cold metalworking project
10.1 Interpret arc welding plans
10.2 Identify arc welding tools, equipment, and supplies
10.3 Demonstrate safe use of arc welding equipment
10.4 Select electrodes
10.5 Select amperage for a given job
10.6 Prepare metal for welding
10.7 Strike and establish an arc
10.8 Start, stop, and restart an arc weld bead
10.9 Perform downhand welding
10.10 Construct an approved arc welding project
11.1 Interpret soldering plans
11.2 Identify and select soldering tools, equipment, and supplies
11.3 Measure, cut, and prepare metal for soldering
11.4 Demonstrate propane torch operations
11.5 Tin a soldering copper
11.6 Demonstrate proper use of a soldering copper

TASK/COMPETENCY SEQUENCE

11.7 Demonstrate proper use of a soldering gun
11.8 Construct an approved soldering project
18.1 Identify essential traits of leadership
18.2 Identify leadership principles
18.3 Identify opportunities for leadership
18.4 Develop an understanding of the FFA
18.5 Use parliamentary procedure
18.6 Participate in in-class FFA activity (including advancement to greenhand degree)
18.7 Develop and give a prepared public speech
15.1 Describe the nature of soil
15.2 Explain the importance of soils
15.3 Explain soil formation processes
15.4 Analyze soil profiles
15.5 Determine soil texture
15.6 Analyze soil structure
15.7 Analyze soil color
15.8 Take soil samples
16.1 Germinate seeds
16.2 Propagate plants asexually
16.3 Prepare a seed bed
16.4 Identify environmental requirements for plant growth
16.5 Determine plant nutritive requirements
16.6 Determine the amount of plant nutrients to apply
16.7 Interpret fertilizer analysis
16.8 Apply plant nutrients
16.9 Select seed
16.10 Plant crop
16.11 Compare methods of weed control
16.12 Describe factors that determine time and frequency of cultivation
16.13 Identify types of cultivation equipment
16.14 Identify ways to procure equipment
16.15 Cultivate crops
16.16 Clean and store equipment
12.1 Interpret woodworking plans
12.2 Identify hand woodworking tools and supplies
12.3 Measure and mark wood
12.4 Select and use hand woodworking tools
12.5 Glue wood materials
12.6 Select and use wood fasteners
12.7 Calculate board feet
12.8 Figure bill of materials
12.9 Identify types of plywood
12.10 Construct an agricultural woodworking project using hand tools
13.1 Interpret masonry plans
13.2 Identify concrete and masonry tools, equipment, and supplies
13.3 Test sand for silt
13.4 Test sand for organic matter

TASK/COMPETENCY SEQUENCE

13.5 Estimate materials for masonry project
13.6 Construct an approved concrete or masonry project
14.1 Demonstrate the importance of working safely with hazardous farm equipment
14.2 Perform daily maintenance and safety checks of hazardous farm equipment
14.3 Attach farm implements to tractor
14.4 Demonstrate universal hand signals of tractor operation
19.1 Describe methods of conserving natural resources
19.2 Develop a forest fire prevention plan
19.3 Plan and establish a wildlife food plot
19.4 Plant forest seedlings
17.1 Plan a home vegetable garden
17.2 Prepare a seed bed for a home vegetable garden
17.3 Apply nutrients to home vegetable garden, based on a soil test
17.4 Plant a home vegetable garden
17.5 Cultivate a home vegetable garden
17.6 Control insects and pests in a home vegetable garden
17.7 Harvest crops from a home vegetable garden
17.8 Develop a plan for maintaining the homestead
17.9 Develop a plan for winterizing the home
17.10 Design a basic landscape plan for the home

AGRICULTURAL SCIENCE AND MECHANICS I

CONTENT OUTLINE	TASK/COMPETENCY CODE
I. Orientation	
A. Scope of agriculture	P1.1
1. Production of food and fiber	E1.1.1
2. Origin of food through consumption	E1.1.2
3. Five main areas of agriculture	E1.1.3
B. Agricultural education program	P1.2
1. Supervised occupational experience	E1.2.1
2. Classroom activities	E1.2.2
3. FFA	E1.2.3
4. Interrelationships among components	E1.2.4
C. Departmental policies and procedures	P1.3
1. Student responsibilities	E1.3.1
2. Daily procedures	E1.3.2
3. Safety procedures	E1.3.3, E1.3.4
4. Objectives and evaluation	E1.3.5
D. Safe use of tools and equipment	P1.4
1. Safety rules	E1.4.1, E1.4.2, E1.4.5
2. Safety hazards	E1.4.3, E1.4.4
E. Use of fire extinguishers	P1.5
1. Origins and classification of fires	E1.5.1, E1.5.3
2. Fire extinguisher materials	E1.5.4
3. Location and use of fire extinguishers	E1.5.2, E1.5.5
F. First Aid	P1.6
1. Location of equipment and personnel	E1.6.1, E1.6.2
2. Identification of supplies	E1.6.3

CONTENT OUTLINE	TASK/COMPETENCY CODE
II. Career Opportunties	
A. Career options	P2.1
1. Job titles	E2.1.1
2. Scope of careers	E2.1.2-E2.1.4
3. Occupational classifications	E2.1.5, E2.1.7
4. Local careers	E2.1.6
B. Local employment opportunties	P2.2
1. Employment terminology	E2.2.1
2. Job information and comparison	E2.2.2, E2.2.3, E2.2.5
3. Job interview	E2.2.4
III. Supervised Occupational Experience Program (SOEP)	
A. Local opportunities	P3.1
1. Job titles and information	E3.1.1, E3.1.2
2. Interviews with local businesses	E3.1.3-E3.1.5
B. Annual occupational plan	P3.2
1. Types of SOE programs	E3.2.1-E3.2.3
2. Benefits of SOE programs	E3.2.4
3. Local opportunities	E3.2.5
4. Individual needs	E3.2.6
C. SOE program agreement	P3.3
1. Purposes	E3.3.1
2. Required information	E3.3.2, E3.3.3
D. Occupational tasks	P3.4
1. SOE program analysis	E3.4.1
2. SOE program variety	E3.4.2
E. Records	P3.5
1. Importance	E3.5.1
2. Types	E3.5.2
3. Procedures	E3.5.3, E3.5.4
4. Storage	E3.5.5

CONTENT OUTLINE	TASK/COMPETENCY CODE
III. F. Summary and Analysis of SOEP records	P3.6
1. Benefits of summary and analysis	E3.6.1
2. Enterprise records	E3.6.2
3. Placement program records	E3.6.3
4. Financial statements	E3.6.4, E3.6.5
5. Evaluation and planning	E3.6.6
G. FFA proficiency awards	P3.7
1. Importance	E3.7.1
2. Identification	E3.7.2
3. Individual application	E3.7.3
H. FFA proficiency award application	P3.8
1. Selection of applicable awards	E3.8.1
2. Required information	E3.8.2
3. Benefits	E3.8.3
I. Plan for securing occupational work experience	P3.9
1. Location of jobs	E3.9.1
2. Job application letters and forms	E3.9.2, E3.9.3
3. Job interview appointment	E3.9.4
4. Appropriate dress for interview	E3.9.5
IV. Agricultural Mechanics Lab	
A. Purposes of agricultural mechanics education	P4.1
1. Definition of agricultural mechanics education	P4.1.1
2. Mechanical areas	E4.1.2
3. Mechanical skills	E4.1.3, E4.1.4
4. Values of competencies	E4.1.5
B. Housekeeping	P4.2
1. Advantages of a clean laboratory	E4.2.1
2. Areas needing cleaning	E4.2.2, E4.2.7
3. Scheduling	E4.2.3, E4.2.4
4. Storage	E4.2.5, E4.2.6, E4.2.8

CONTENT OUTLINE	TASK/COMPETENCY CODE
IV. C. Laboratory organization	P4.3
1. Color coding	E4.3.1
2. Supervision	E4.3.2
3. Procedures	E4.3.3-E4.3.6
4. Storage	E4.3.7
D. Laboratory safety	P4.4
1. Safety rules and equipment	E4.4.1, E4.4.2
2. Signs, symbols, and color codes	E4.4.3
3. Fire extinguishers	E4.4.4, E4.4.5
4. Operation of equipment	E4.4.6
5. Hazardous situations	E4.4.7
V. Drawing and Sketching	
A. Equipment and supplies	P5.1
1. Values and identification	E5.1.1, E5.1.2
2. Selection	E5.1.3
3. Purpose	E5.1.4
4. Use	E5.1.5
B. Lines	P5.2
1. Different types	E5.2.1
2. Equipment	E5.2.2
3. Techniques	E5.2.3
4. Length, weight, scale	E5.2.4-E5.2.6
5. Evaluation	E5.2.7
C. Views of objects	P5.3
1. Procedures	P5.3.1
2. Orthographic projection	E5.3.2
3. Three-view detail	E5.3.3
4. Objects with hidden features	E5.3.4
5. Visible, hidden, and center lines	E5.3.5
6. Dimension	E5.3.6
7. Evaluation and standards	E5.3.7, E5.3.8

CONTENT OUTLINE	TASK/COMPETENCY CODE
V. D. Freehand	P5.4
1. Advantages	E5.4.1
2. Procedures	E5.4.2
3. Techniques	E5.4.3
4. Three-view detail	E5.4.4
5. Pictorial sketch	E5.4.5
E. Laboratory project plan	P5.5
1. Sheet size, scale, spacing	E5.5.1
2. Orthographic view	E5.5.2
3. Pictorial view	E5.5.3
4. Dimension	E5.5.4
5. Evaluation	E5.5.5
VI. Metals Identification	
A. Physical properties	P6.1
1. Sources of information	E6.1.1
2. Surface, finish, color, texture	E6.1.2
3. Samples	E6.1.3
B. Sparks test	P6.2
1. Sources of information	E6.2.1
2. Color and type	E6.2.2
3. Grinding and matching	E6.2.3
C. Chip test	P6.3
1. Sources of information	E6.3.1
2. Hammer and chisel	E6.3.2
3. Comparison of chips with chart	E6.3.3
4. Determination of metal type	E6.3.4
D. Magnetic test	P6.4
1. Magnetic and non-magnetic metal	E6.4.1
2. Differentiation	E6.4.2
3. Category identification	E6.4.3
E. Acid test	P6.5
1. Metals reactive to vinegar	E6.5.1, E6.5.2
2. Category identification	E6.5.3

CONTENT OUTLINE	TASK/COMPETENCY CODE
VII. Hot Metalworking Operations	
A. Interpretation of plans	P7.1
1. Terminology and symbols	E7.1.1
2. Tools and materials	E7.1.2
3. Needed skills	E7.1.3
4. Estimates of cost and time	E7.1.4, E7.1.5
B. Tools, equipment, and supplies	P7.2
1. Selection	E7.2.1
2. Uses	E7.2.2
C. Heating of metal	P7.3
1. Sources of heat	E7.3.1-E7.3.3
2. Selection of heat source	E7.3.4
3. Safety	E7.3.5
4. Operation of heat source	E7.3.6, E7.3.7
D. Annealing of ferrous metal	P7.4
1. Terminology	E7.4.1, E7.4.2
2. Metal temperature	E7.4.3
3. Process of annealing	E7.4.4
4. Safety	E7.4.5
5. Heat sources	E7.4.6, E7.4.7
6. Cooling of metal	E7.4.8
7. Filing of metal	E7.4.9
E. Hardening of ferrous metal	P7.5
1. Terminology	E7.5.1, E7.5.2
2. Metal temperature	E7.5.3
3. Process of hardening	E7.5.4
4. Safety	E7.5.5
5. Heat sources	E7.5.6, E7.5.7
6. Cooling of metal	E7.5.8
7. Filing of metal	E7.5.9

CONTENT OUTLINE	TASK/COMPETENCY CODE
VII. F. Tempering of ferrous metal	P7.6
1. Terminology	E7.6.1, E7.6.2
2. Metal temperature	E7.6.3
3. Process of tempering	E7.6.4
4. Safety	E7.6.5
5. Heat sources	E7.6.6
6. Reheating of metal	E7.6.7
7. Cooling of metal	E7.6.8
G. Shaping of metal	P7.7
1. Specifications and plans	E7.7.1
2. Type and quality of metal	E7.7.2
3. Tools, equipment, and supplies	E7.7.3
4. Processes of shaping	E7.7.4
5. Heat treatment requirements	E7.7.5
6. Safety	E7.7.6
7. Sources of heat	E7.7.7, E7.7.8
8. Verification of measurements	E7.7.9
H. Hot metalworking project	P7.8
1. Selection and interpretation of plans	E7.8.1, E7.8.2
2. Tools, equipment, and supplies	E7.8.3
3. Estimates of cost and time	E7.8.4
4. Description of operations	E7.8.5
5. Safety	E7.8.6
6. Verification of measurements	E7.8.7
VIII. Reconditioning of Agricultural Tools	
A. Tool-fitting plans	P8.1
1. Terminology and symbols	E8.1.1
2. Tools and materials	E8.1.2
3. Estimates of cost and time	E8.1.3, E8.1.5
4. Needed skills	E8.1.4
B. Tools, equipment, and supplies	
1. Identification	E8.2.1
2. Desirable qualities	E8.2.2

CONTENT OUTLINE	TASK/COMPETENCY CODE
VIII. C. Tool-fitting template	P8.3
1. Tools, equipment, and supplies	E8.3.1
2. Safety	E8.3.2
3. Proper angles	E8.3.3-E8.3.7
4. Finish or preservative	E8.3.8
D. Use of grinder	P8.4
1. Safety	E8.4.1, E8.4.5
2. Alignment	E8.4.2
3. Grinding wheel	E8.4.3, E8.8.4
	E8.4.6
4. Procedures	E8.4.7
E. Tool cleaning and preservation	P8.5
1. Tool composition	E8.5.1
2. Materials and procedures	E8.5.2-E8.5.4
F. Tool handles	P8.6
1. Tools and supplies	E8.6.1
2. Procedures	E8.6.2-E8.6.4
3. Application of finish	E8.6.5
G. Tool reconditioning	P8.7
1. Tools, equipment, and supplies	E8.7.1
2. Estimates of cost and time	E8.7.2
3. Procedures	E8.7.3
4. Safety	E8.7.4
5. Application of preservative	E8.7.5
IX. Cold Metalworking Operations	
A. Interpretation of plans	P9.1
1. Shapes	E9.1.1
2. Terminology and symbols	E9.1.2
3. Materials	E9.1.3

CONTENT OUTLINE	TASK/COMPETENCY CODE
IX. B. Tools, equipment, and supplies	P9.2
1. Measuring and marking	E9.2.1
2. Cutting	E9.2.2
3. Bending and shaping	E9.2.3
4. Tapping and cutting	E9.2.4
5. Files	E9.2.5
C. Measuring and layout of metal	P9.3
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3. Methods	E17.7.3-E17.7.5
4. Storage of vegetables	E17.7.6
H. Plan for maintaining the homestead	P17.8
1. Purpose of inventory	E17.8.1
2. Buildings, machinery, equipment inventory	E17.8.2
3. Schedule and record of maintenance	E17.8.3
4. Hazardous conditions	E17.8.4
I. Plan for winterizing the home	P17.9
1. Advantages	E17.9.1
2. Insulation types	E17.9.2
3. Identification of needs	E17.9.3-E17.9.5
J. Basic landscape plan for the home	P17.10
1. Terminology and symbols	E17.10.1, E17.10.5
2. Three major areas	E17.10.2
3. Overall objectives	E17.10.3
4. Three rules of thumb	E17.10.4
5. Tree and shrub sampler	E17.10.6

AGRICULTURAL SCIENCE AND MECHANICS II

COURSE DESCRIPTION:	Agricultural Science and Mechanics II is a one-year, single-period, occupational preparation course usually offered at the ninth-grade level. Approximately one-half of the course is devoted to agricultural mechanics with emphasis placed on skill development in fundamentals of electricity, arc welding, gas cutting and welding, small engines, power woodworking, and wood and metal preservatives. Instruction is also provided in animal science and further development of competencies in rural and urban living, leadership, and resource conservation.
PREREQUISITE:	Agricultural Science and Mechanics I
SUGGESTED GRADE LEVEL:	9, 10 Note: When Agricultural Science and Mechanics I is started in the ninth grade, Agricultural Science and Mechanics II may be offered in the tenth grade and only two years of an agricultural course option will be available at the eleventh- and twelfth-grade levels.

TASK/COMPETENCY SEQUENCE

2.3 Identify possible careers in off-farm agricultural occupations
2.4 Outline a tentative course of study in advanced agricultural education
3.2 Develop an annual plan of occupational experience
3.3 Prepare an occupational experience program agreement
3.4 Identify occupational tasks
3.5 Keep records
3.6 Summarize and analyze records of supervised occupational experience programs
3.7 Select FFA proficiency awards applicable to supervised occupational experiences
3.8 Complete FFA proficiency award application
3.9 Demonstrate ability to secure occupational work experience
10.11 Explain natural phenomena (principles) involved in arc welding
10.12 Control excess distortion, warping, and cracking during welding
10.13 Perform vertical-down welding
10.14 Perform horizontal welding
10.15 Perform vertical-up welding
10.16 Perform overhead welding
10.17 Hardsurface metal with an arc welder
10.18 Cut metal with an arc welder
24.1 Interpret gas welding and cutting plans
24.2 Demonstrate safe use and maintenance of gas welding and cutting equipment
24.3 Select gas welding and cutting tips
24.4 Select gas pressures

TASK/COMPETENCY SEQUENCE

24.5 Prepare metal for gas welding and cutting
24.6 Weld stringer bead without filler rod
24.7 Perform fusion welding without filler rod
24.8 Butt weld with filler rod
24.9 Braze weld a butt joint
24.10 Cut metal
24.11 Hardsurface with gas welding equipment
24.12 Weld cast iron
28.1 Interpret a blueprint for plumbing
28.2 Identify plumbing tools, equipment, and supplies
28.3 Identify pipe fittings
28.4 Cut a steel pipe to proper length
28.5 Thread pipe
28.6 Install pipe fittings
28.7 Cut copper tubing
28.8 Solder copper tubing to fitting
28.9 Join plastic pipe to fitting with solvent
28.10 Repair leaky valves
28.11 Complete an approved plumbing exercise
18.5 Use parliamentary procedure
18.7 Develop and give a prepared public speech
18.8 Develop an awareness of the FFA constitution
18.9 Apply for chapter office
20.1 Identify the importance, origin, and characteristics of breeds of beef cattle
20.2 Identify the importance, origin, and characteristics of breeds of dairy cattle
20.3 Identify the importance and characteristics of breeds of poultry
20.4 Identify the importance and characteristics of breeds of sheep
20.5 Identify the importance, origin, and characteristics of breeds of swine
21.1 Use judging terms
21.2 Use judging score card
21.3 Use and keep pedigree and performance records
21.4 Identify reasons for placing animals within classes
22.1 Identify nutrient needs of farm animals
22.2 Describe how farm animals use feed
22.3 Describe the use of pasture to feed livestock
22.4 Describe the use of harvested forages in feeding livestock
22.5 Describe the use of grains in feeding livestock
22.6 Describe the use of protein supplement in rations
22.7 Describe the use of minerals in rations
22.8 Balance livestock rations
22.9 Select balanced rations for livestock
25.1 Identify parts and components of small gasoline engines
25.2 Explain how small gasoline engines work
25.3 Compare the operation of four-stroke cycle and two-stroke cycle engines
25.4 Use operator's manual
25.5 Use precision measuring equipment
25.6 Service and maintain fuel system of small gasoline engine

TASK/COMPETENCY SEQUENCE

25.7 Service and maintain air system of small gasoline engine
25.8 Service lubrication system of small gasoline engine
25.9 Service and adjust carburetor of small gasoline engine
25.10 Service and maintain ignition system of small gasoline engine
25.11 Service manual controls of small gasoline engine
25.12 Troubleshoot a small gasoline engine
12.11 Select and use agricultural power woodworking tools
12.12 Adjust and maintain power woodworking tools (portable and stationary)
12.13 Identify types of wood
12.14 Construct an agricultural woodworking project using power tools
26.1 Identify and select wood and metal preservatives and equipment
26.2 Estimate the amount of preservative needed for a job
26.3 Prepare wood and metal surfaces for preservation
26.4 Apply preservatives to wood and metal surfaces with a paint brush
26.5 Clean and store a paint brush
26.6 Apply preservatives to wood and metal surfaces with a paint roller or pad
26.7 Apply preservatives to wood and metal surfaces with spray equipment
23.1 Explain the principles of electricity
23.2 Identify and draw electrical symbols
23.3 Calculate resistance, volts, and amperes using Ohm's Law
23.4 Determine amount of electrical energy used
23.5 Determine cost of electrical energy used
23.6 Distinguish between parallel and series circuits
23.7 Identify electrical tools, equipment, and supplies
23.8 Demonstrate safety in working with electricity
23.9 Splice electrical wires
23.10 Connect wires with soldering connectors
23.11 Install electrical apparatus (switches, receptacles, fixtures, and finish plates)
23.12 Repair an appliance cord
23.13 Construct an approved electrical project
23.14 Clean and lubricate an electric motor
27.1 Select and care for rope
27.2 Finish the end of a rope
27.3 Join two ropes
27.4 Splice rope
27.5 Make a rope halter
14.5 Operate tractor safely
14.6 Use communication equipment
19.5 Identify Virginia forest trees
19.6 Identify common Virginia game fish
19.7 Identify common Virginia game animals and game birds
19.8 List common game and fish laws in Virginia
19.9 Identify methods used to conserve water
19.10 Identify methods used to conserve soil
19.11 Participate in Keep Virginia Green program

TASK/COMPETENCY SEQUENCE

19.12 Manage a small woodlot
17.11 Select appropriate landscape materials for the rural or urban home
17.12 Plant landscaping materials
17.13 Prune and care for a landscaped area
17.14 Establish a lawn
17.15 Care for and maintain a lawn

AGRICULTURAL SCIENCE AND MECHANICS II

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B. Advanced course-of-study options	P2.4
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2. Evaluation of options	E2.4.2, E2.4.3
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2. Types	E3.5.2
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2. Enterprise records	E3.6.2
3. Placement program records	E3.6.3
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5. Evaluation and planning	E3.6.6
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CONTENT OUTLINE	TASK/COMPETENCY CODE
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2. Equipment and supplies	E10.13.2
3. Amperage	E10.13.3
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5. Evaluation	E10.14.9

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2. Service requirements	E10.17.2
3. Surfacing electrodes	E10.17.3
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5. Safety	E10.17.5, E10.17.12
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4. Marking of metal	E10.18.4
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CONTENT OUTLINE	TASK/COMPETENCY CODE
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CONTENT OUTLINE	TASK/COMPETENCY CODE
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CONTENT OUTLINE	TASK/COMPETENCY CODE
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CONTENT OUTLINE	TASK/COMPETENCY CODE
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APPENDIX A

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APPENDIX B

AUDIOVISUAL SUPPLIERS

Agri-Farm Productions, Inc.
1019 Market Street
Box 43
Gowrie, Illinois 50503

Bergwall Productions, Inc.
Box 238
Garden City, New York 11530-0238

Briggs and Stratton Corporation
Box 702
Milwaukee, Wisconsin 53201

DCA Educational Products
424 Valley Road
Warrington, Pennsylvania 18946

Future Farmers of America
National FFA Supply Service
5632 Mt. Vernon Memorial Highway
Alexandria, Virginia 22309

Hobar Publications
1234 Teller Road
St. Paul, Minnesota 55112

Mid-America Vocational Curriculum Consortium
1500 West 7th Avenue
Stillwater, Oklahoma 74074-4364

NASCO
901 Janesville Avenue
Fort Atkinson, Wisconsin 53538

Research and Curriculum Unit
Vocational and Technical Education
Mississippi State University
Mississippi State, Mississippi 37962

Teaching Aids
Box 1798
Costa Mesa, California 92626-0728

Vernard Films, Ltd.
Box 1332
Peoria, Illinois 61654

Vocational Agricultural Service
University of Illinois
434 Mumford Hall
Urbanna, Illinois 61801

Virginia Department of Education
Audiovisual Services
Box 6Q
Richmond, Virginia 23216

Virginia Cooperative Extension Service
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

Vocational Education Productions
California Polytechnic State University
San Luis Obispo, California 93407

West Virginia Vocational Curriculum Laboratory
West Virginia University
Charleston, West Virginia 25301

APPENDIX C

TOOLS AND EQUIPMENT

Adding machine
Adjustable metal stands
Air compressor
Anvil w/stand
Application software
Battery charger
Battery charger accessories
Battery service kits
Battery starter tester
Battery testers
Benches, metal work
Benches, portable metal workbench
Bits, drill, sets
Bookcase
Box, mitre
Branding sets
Building, storage (small aluminum siding)
Bushing inserter and remover
Cabinets, storage
Calculator
Caliper (sets)
Camera
Cement mixer
Chairs
Chalkboard
Chisels, cold (set)
Chisels, wood (set)
Clamps "C" (set)
Cleaner, steam or high pressure
Cold frames
Copy machines for transparencies
Cultivators
Current indicator
Desk, office
Desk, secretary
Desk, teachers
Disk drive
Diskettes
Display racks and showcases
Dividers (set)
Drawing set
Drill bits (set)
Drill presses w/accessories
Drill presses, wood and metal
Drill, hand electric
Drill, portable
Drop spreader
Duplicator, mimeograph
Dust collection system
Dust particle removing system
Electric clippers
Electric groomer
Electrical kits
Electrical teaching cabinet
Engine repair stand
Engines, small gasoline
Engraver, electric
Engraving tool
Extinguishers, fire
Farm level, telescopic and tripod
File basket
File cabinet
Files w/handles (set)
Filmstrip and record player comb.
Fume removal system
Furnace, heat treating
General hand tool sets
Grass shears
Greenhouse benches
Greenhouse pot moving carts
Grinder, compost
Grinders, portable and pedestal
Ground fault interrupter
Hacksaws, power
Heating tables w/thermostats
Hollow punches (set)
Hoses with reel
Hot beds
Ignition tester
Incandescent photoperiod lights
Jack, hydraulic
Jointer
Ladder, 20 ft., 200 lb. rated
Ladder, step
Lathe house
Lathe, wood w/tools and plates

Lawn edger/trimmers
Lawn roller
Lawn vacuum
Lettering equipment for signs
Levels (surveyor)
Livestock chute
Livestock scale
Lubrication equipment
Manuals
Map and chart file
Masonry hand tools (set)
Microcomputer
Micrometers (set)
Microscopes
Microscopes, binocular
Models
Modem
Monitor
Monitor, safety glasses
Movie projector
Mowers
Overhead projectors
Painting equipment
Parts bin
Parts washer
Pipe threaders (set)
Planer
Plows
Portable floor crane
Postage scale
Press, arbor
Press, hydraulic
Printer
Projection screen
Projection table
Rack, magazines
Rake
Rear projection screen
Record player
Recorder, tape
Recorder, video
Reference books
Reference manuals
Riveting tools
Riveting tools, rex riveting machine
Rotary tiller
Safety shields
Sander, portable
Sander, disc
Saw, radial arm
Saw, band wood
Saw, metal power hack
Saw, portable circular
Saw, tilting arbor
Shear, lever
Shear, metal cutting
Sickle bar tools
Simulator
Slide and filmstrip projector
Slide projector
Slide sets
Small engine stands
Small engine tools
Soldering and sheet metal hand tools (set)
Sprayers
Sprayers, paint
Spreaders, lime
Stamping sets
Standard paper cutter
Stool, machinists work
Student tables (desks)
Styrofoam cutter
T.V. monitor
Tacker-stapler
Tamper
Tap and die (set)
Tattoo set
Teacher station
Telephones
Testers, circuit
Time clock
Tire tools
Torches, carbon arc
Torque wrenches (set)
Tractor maintenance hand tools (set)
Tractor w/equipment
Transparency sets
Truck
Typewriter
Vacuum cleaner
Vice, machinists
Vice, pipe
Video tape recorder
Vices, wood, metal and pipe
Welders, arc
Welders, mig

Welders, oxygen - acetylene
Welders, spot
Welders, tig
Welding booth
Welding screen
Welding stool
Welding table
Welding, accessories
Welding, cylinder truck
Wheelbarrow
Woodworking hand tools (set)
Workbenches, wood and metal
Wrenches, including open end, box end, combination, socket, and allen (sets)
Wrenches, pipe, external (set)
Wrenches, pipe, internal (set)
*Cabinets, tool storage
*Cabinets, mobile tool
*Panels, tool
*Boards, tool assortment

*Includes woodworking, metal working, masonry, tool fitting, electrical, small engine tools, etc.

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